Financial derivatives use and firm value

in East Asian non-financial firms

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ABSTRACT

Derivatives have been using widely in the world over the last 30 years as an important risk management instrument. Although theoretical researchers suggest that derivatives usage can enhance value of a firm by alleviating costs arising from several market imperfections, the existing evidence is not quite consistent among empirical studies up to date. The purpose of this thesis, therefore, aims to examine determinants of derivatives use, a relationship between derivatives use, firm value, and exposures for a sample of 881 non-financial firms in eight East Asian countries in the 2003- 2013 period. The analysis is based on a novel and manually collected data.

We find that firms in countries with lower corruption have more incentive to use financial derivatives and use derivatives with greater intensity than those firms located in highly corrupt countries. Better governance induces firms to use derivatives to hedge exposure and mitigate costs. Firms in countries with weak governance use derivatives for speculating and/or selective hedging or self-management purposes. Overall, our findings provide strong evidence of the role of countries' governance quality in driving firms' derivatives-related behaviors. This macro-based effect on derivatives use is independent from firm-specific factors, which are frequently invoked by hedging theories.

Regarding relationship between firm value and derivatives use, using Tobin's Q as a proxy of firm value, we find that low corruption level of home country (host country) induces the use of financial derivatives and rewards domestic firms and domestic MNCs (foreign affiliates) with higher value; this finding holds after controlling for endogeneity and self-selection bias. Hedging behavior of domestic MNCs outperforms domestic firms and foreign affiliates in terms of firm value. Derivative usage is value-enhancing activity for domestic firms and domestic MNCs, but it does not add value for foreign affiliates. During the crisis, the effect of low level of corruption on alleviating

negative impacts of the crisis on derivatives usage is very modest. Yet, low corruption level of home country is positively associated with hedging premiums of domestic firms and domestic MNCs in the post-crisis period.

Finally, we measure exposure to home (host) country risks, and provide novel evidence that financial derivatives use of domestic firms and domestic MNCs reduces exposure to home country risks by 11.4% and 13.4% per 1% increase in notional derivative holdings, respectively, while foreign affiliates fail to mitigate exposure to host country risks. The use of foreign currency and interest rate derivatives by domestic firms and domestic MNCs is effective in alleviating firms' such exposures to varied degrees, but foreign affiliates using derivatives only can lower interest rate exposures. Domestic MNCs have the smallest exposures, and domestic MNCs with derivatives activities reduce exposures in the largest magnitude compared to other firms. The financial crisis weakens the effect of derivative usage on exposures, but it is stronger after the crisis than in pre-crisis period.

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CHAPTER 1

INTRODUCTION

1.1. Introduction

This thesis focuses on one of the most talked-about financial instruments among both academics and policy makers: derivatives. A key feature of derivatives is that their prices are dependent upon or derived from one or more underlying financial assets. The most common types of financial derivatives include foreign exchange, interest rate and commodity price derivatives. These instruments aim to protect participants in financial markets from adverse movements in prices of the underlying assets. Following the deregulation of interest rate controls and the adoption of floating exchange rate system in many countries, especially the global financial crisis of 2007-2008, the movements of interest rates and foreign exchanges rates have become much more volatile. Facing increasing volatility of financial risks, managers in many companies have been using derivatives as one of the most important hedging strategies.

Derivatives have been using widely in the world, and contributing significantly to the strong growth and innovation of financial markets over the last 30 years. Given the global scale and trading volume of derivative markets, derivatives have become more complicated and interconnected. The Bank for International Settlement reports that at the end of June 2015, and at the end of December 2014, the global OTC derivatives notional amount outstanding contracts are USD 553 trillion, and USD 630 trillion (BIS, 2014, 2015). These figures indicate that derivatives are one of the main pillars in the global financial system. In addition, globalization and capital liberalization speeding up enormously over the past decades have encouraged firms to

increasingly involve in international operations, many firms are no longer uni-national domestic firms but multinational corporations (henceforth MNCs). By going global, firms are increasingly exposed to market and financial risks. Thus, risk management is going hand-in-hand with the globalization, and one of the strategies that firm apply is to use financial derivatives. The survey of the International Swaps and Derivatives Association shows that over 94% of the world's top 500 companies actively use financial derivatives to hedge their various exposures (ISDA, 2009).

However, the rationales for hedging have not been well sustained. According to the irrelevance proposition of Modigliani and Miller (1958), in an efficient market, hedging activities should have no impact on a firm value. Some studies have theoretically shown that hedging can increase firm value by reducing costs arising from several market imperfections such as taxes, agency problems, bankruptcy and financial distress, managerial incentives, information asymmetries, and economies of scale. Nevertheless, many empirical studies do not find evidence supporting those propositions. For example, Graham and Rogers (2002), Charumathi and Kota (2012). Moreover, Bartram, Brown, and Fehle (2009) indicate that traditional theories have little power to explain firm's decision on using derivatives.

Yung-Ming Shiu (2010) classifies derivatives use studies into 2 categories. The first is to identify the determinants of decisions on derivatives use. Another strand of research is to examine the effect of derivative use on risk exposure, and firm value. In fact, the extant empirical evidence on this area is still mixed. Some studies find positive relationship between derivatives use and firm value (e.g., Allayannis and Weston, 2001; Clark and Judge, 2009; Campello, Lin, and Zou, 2011; Chen and King, 2014), and negative association between exposures and derivatives usage (see Nguyen and Faff, 2010; Zhou and Wang, 2013). However, some researchers find opposite evidence or no evidence (e.g., Fauver and Naranjo, 2010; Clark

and Mefteh, 2011). Therefore, the incentives for using financial derivatives and the effect of derivatives use on firm value or exposures are still an open question. Judge (2006b) indicates that whichever it is, one thing is certain, existing research has only touched the surface and many unresolved issues remain.

Although there is a wide range of literature on country and international evidence on this area, most empirical studies focus on the derivatives usage of U.S non-financial firms. Besides, there is a growing literature on derivatives in developed countries, and emerging countries, but the research East Asian firms is still relatively scarce, even though there have been large increase in using derivatives in these countries. The annual survey of the Future Industry Association in 2015 reveals that trading in Asia-Pacific is $7.25 billion, accounting for about one-third of global trading volume (FIA, 2015).

The purpose of this thesis, therefore, aims to examine determinants of derivatives use, impacts of derivatives usage on firm value, and a relationship between derivatives use and multifaceted exposures in eight East Asian countries over the period of 2003- 2013 by using the unique hand-collected data containing information about derivatives activities of 881 non-financial firms across 34 different industries. Our sample consists of countries with different economic and financial development levels, from the world's third and second largest economies (Japan, China) to newly industrialized countries (Singapore, Hong Kong) and then emerging markets (Thailand, Philippines, Indonesia, Malaysia).

Additionally, these sample countries are also heterogeneous in terms of economic, political and business environments. In particular, governance mechanism varies among East Asian countries. Some countries share the same governance quality as that by U.S, and other developed countries. Some are more problematic because of less transparent markets, weaker law

enforcement and lower government effectiveness. Such variation provides us a natural laboratory to explore the effect of country governance mechanism on derivatives use. Further, there is huge difference in corruption levels of the sample countries. For example, according to the most recent 2015 survey of the Transparency International, in which a higher score represents less corruption, Philippines and Indonesia are at low scores of 35 and 36 out of 100, respectively, while Singapore scores a high 85 relative to Japan at 75. Likewise, our sample countries have different degrees of country risks, for example Singapore has AA grade while grades of Indonesia and Thailand are B[1]. Such heterogeneity allows us to examine whether differences in firms' behaviors of using derivatives across countries can be explained by differences in institutional environments. Doing so, our study may provide further insights into an emerging literature linking macro and firm-specific factors.

Our first study in the chapter 4 investigates the link between incentives to use derivatives of non-financial firms and countries' governance quality. Determining a firm's motivation for using derivatives is vital for at least two reasons. First, it helps managers diagnose what sources enhancing firm value, because given a type of market imperfection benefits of derivatives use differ across different firms. Second, it induces managers to figure out what type of risk(s) should be hedged and identity targets of hedging, so that they can conduct an effective hedging strategy.

Differentiating from prior studies, we focus on the role of country-specific factors, specifically governance quality, in shaping firms' decisions on using derivatives. The reason motivating us to conduct this study is that the sample countries are heterogeneous in terms of economic, political and social environments. The relatively large variation in country-specific

[1] Euler Hemes. 2015. *Country risk rating March 2015*

characteristics gives us a unique opportunity to explore other determinants than firm's specific factors - which frequently invoked by hedging theories. Additionally, as a matter of fact that although the literature on derivatives use has been blossoming, most empirical studies focus on U.S non-financial firms. Meanwhile, research on hedging behavior of East Asian firms is still very limited, even though they have become the world's key derivative users as we presented above. Further, given many of our firms (nearly 45%) are domestic, 48.23% is domestic multinational corporation (MNC) headquarters, we would expect the role of country's specific characteristics to become more salient in determining derivatives use.

In our second study, we explore the value implication of derivatives usage on domestic firms, domestic MNCs, and foreign affiliates conditional on corruption environments in home and host countries. The motivation behind this research comes from the following reasons. First, although the previous studies provide significant insights into the relationship between derivatives use and firm value, drivers of value implication are not limited to the structural characteristics of firm-specific resources and capabilities, as all firms are embedded in institutional environments. As a matter of fact that corruption becomes the norm rather than exception worldwide today and firms regularly engage in corrupt practices such as bribery (Beets, 2005). In East Asian countries, corruption is a serious problem[2]. Thus, without directly taking into account corruption environment, it would be difficult to determine whether the use of derivatives is value-enhancing activity.

Second, scholars have neglected what type of firm in which the value effect of derivatives use is greater (or less), and what factors determining such difference. Undertaking this research

[2] According to the Transparency International, in 2013, 64% of these countries scored below 50 in perceived level of public corruption

need, we shed new light on this gap by examining how value effects of derivatives use vary across domestic firms, domestic MNCs and foreign affiliates. Third, although there are numerous studies on effects of financial crisis on economic area, little has been done to analyze its impacts on derivatives use. Thus, we investigate the dynamic of relationship between derivatives use and firm value when firms face exogenous shocks brought about by the 2007-2008 global financial crisis. Our study does not merely investigate consequences of the global financial crisis on value implication of derivatives usage, but focus on the role of corruption levels in mitigating adverse effects.

Our third study in the chapter 6 scrutinizes the impact of derivatives usage on exposures to country risks, exchange rate, and interest rate risks by types of firm: domestic firms, domestic MNCs, and foreign affiliates. Our research is inspired by the following reasons. First, while we have long learned over the last decades about exposures to exchange rate, and sometimes interest rate exposures; to the best of our knowledge, the research linking derivatives use with exposure to country risk is nonexistent in the current literature. Thus, our study aims to estimate exposure to home (host) country risks and investigate the relationship between derivatives use and those types of exposure.

Second, whether MNCs are more exposed than domestic firms and other firms is not well understood because most of the prior studies on exposures and derivatives use rule out domestic firms by explicitly focusing on MNCs, while a purely domestic firm still is exposed to market risks. Therefore, we examine the link between derivatives use and exposures on the comparison of domestic firms, domestic MNCs, and foreign affiliates. We also consider how this link is moderated by the 2007-2008 global financial crisis.

Third, in recent years many interest rates exhibit as volatile as exchange rates, presenting a comparably important source of risk to firms as exchange rate risks, but up to date little has been done on interest rate exposure of non-financial firms in general, and on link between that exposure and derivatives use in particular. Thus, we aim to present comprehensive analysis of the relationship between derivatives use and interest rate exposure for a large sample of cross-country non-financial firms.

1.2. Meaning and characteristics of financial derivatives

There are many definitions of derivatives. Hull (2012, pp.1) defines derivatives as a financial instrument whose prices are dependent on or derived from the value of other, more basic, underlying variables. According to the Statement of Financial Accounting Standards (SFAS) No.133, *Accounting for Derivative Instruments and Hedging Activities*, derivative is a contract with the following distinctive characteristics: a) it has one or more underlying assets; b) it has one or more notional amounts; c) its value to the holder changes by direct reference to the underlying assets; c) it requires no initial net investment; d) it can readily be settled net or its equivalent.

An underlying is not, per se, an asset or liability that appears on the balance sheet; an underlying is a market-related characteristic of the asset or liability that gives increase in value changes (Smith, Gastineau, and Todd, 2001). More specifically, Gupta (2006) states that the underlying assets or instruments can be equity shares, stocks, bonds, debentures, treasury bills, foreign currencies, interest rates, commodity prices, or different market indices such as stock market index, consumer price index, etc. Thus, derivatives have no intrinsic value rather their value is determined by volatility of the underlying's prices.

A notional amount is a number of currency units, shares, units of commodities, or other units specified in the contract. Notional amount, in sense of Stulz (2003), is quantity of the underlying used to determine the payoff of derivative. Because a derivative does not require the holder or writer to invest or receive the notional amount at the time of entering contract, so the contract may require no initial investment or a small investment relative to other instruments that are sensitive to movements of the same market factors.

There have been a large number of financial derivatives being used extensively all over the world in the last few decades. However, in the context of this thesis, we focus on the types most widely used by non-financial firms in different countries to manage market risks: foreign currency, interest rate, and commodity price derivatives. When the underlying instruments are foreign currencies, interest rates, and commodity prices, the types of derivatives will be foreign currency, interest rate, and commodity price derivatives, respectively.[3]

1.3. Aim and research questions

The aim of the thesis is to provide a deep analysis of whether the use of derivatives increases firm value to non- financial firms in East Asian countries.

To realize this aim, our research questions are as below:

(1)- What are the determinants of the derivatives use among East Asian non-financial firms?

We investigate the link between governance quality and non-financial firms' incentives to use all types of derivatives: foreign exchange, interest rate and commodity price derivatives. In particular, we propose the following hypotheses:

[3]Foreign currency, interest rate, and commodity price derivatives are settled at a specific future date, and their values are derived from changes in foreign currencies (exchange rates), interest rates, and prices of commodities, respectively.

Hypothesis 1: Firms located in countries with higher corruption levels are less likely to use derivatives

Hypothesis 1a: High levels of corruption discourage firms from using derivatives to reduce exposure as stated by hedging theory

Hypothesis 2: Firms located in countries with higher governance quality are more prone to use derivatives

Hypothesis 3: Firms in countries with higher country risk have more incentive to use derivatives.

(2)- What is the value effect of derivatives use on non- financial firms in East Asian countries?

We explore the unique value effect of derivatives use on domestic firms, domestic MNCs and foreign affiliates from different aspects of corruption environments, and in the context of the financial crisis of 2007-2008 to answer the following research questions:

Hypothesis 4: The lower is the corruption level; the higher is the likelihood that the use of financial derivatives increases firm value

Hypothesis 5a: In light of corruption environment, the use of financial derivatives is more valuable in domestic MNCs than in domestic firms

Hypothesis 5b: Under influence of corruption environment, the use of financial derivatives rewards domestic MNCs with higher value than foreign affiliates

Hypothesis 6a: The global financial crisis worsens the value effect of derivatives usage under corruption environment, and there is positive relationship between derivatives use and firm value in post-crisis period

Hypothesis 6b: Low level of corruption mitigates negative impacts caused by the global financial crisis on the value effect of derivatives use

(3)- Does the use of derivatives of East Asian non- financial firms reduce exposures that firms face?

The purpose of this study is to examine the relationship between derivatives use and exposures to country risks, exchange rate, and interest rate risks on the comparison of domestic firms, domestic MNCs and foreign affiliates. To do so, we test the hypotheses as below:

Hypothesis 7a: The use of foreign currency derivatives reduces exchange rate exposure

Hypothesis 7b: The use of interest rate derivatives reduces exposure to interest rate risk

Hypothesis 8: There is negative relationship between the use of financial derivatives and exposure to country risk

Hypothesis 9: The use of derivatives by domestic MNCs decreases a larger magnitude of exposure than domestic firms and foreign affiliates

Hypothesis 10a: The global financial crisis weakens the relationship between derivatives usage and exposures.

Hypothesis 10b: Derivatives use is negatively related to exposures in the post-crisis period

1.4. Structures of the thesis

This thesis consists of 7 chapters including this chapter. It is structured as follows.

Chapters 2 and 3 review the vast part of theoretical and empirical literature on this topic over a few decades, which provides a critical review of the theoretical determinants of derivatives use, relationship between the use of derivatives and firm value, and its association

with exposures. In addition, chapter 3 presents a big picture of empirical analyses with important findings both outside and in East Asia context.

Chapter 4 attempts to empirically scrutinize the role of country-level governance quality of eight countries in East Asia on shaping non-financial firms' motivations for using derivatives. Chapter 5 demonstrates thoroughly analysis of the effects of derivatives use on firm value under influence of corruption environment of home (host) countries with a focus on comparing such effects across domestic firms, domestic MNCs, and foreign affiliates.

Chapter 6 contains empirical study on the association between the use of derivatives and exposures to country risks, exchange rate, and interest rate risks on the comparison of domestic firms, domestic MNCs, and foreign affiliates. Finally, chapter 7 concludes by summarizing main findings from empirical investigations, presents contributions of this thesis including theoretical contributions, empirical contributions, and managerial implications, and it also makes some suggestion for the future research based on some limitations of this study.

CHAPTER 2

REVIEW OF THE THEORETICAL LITERATURE

2.1. Introduction

Modigiliani and Miller (1958) indicate that in an efficient market, financing policy is irrelevant. Because derivatives use or hedging is a part of corporate financing policy, their arguments imply that in the absence of market imperfections, hedging does not affect firm value. The value of a firm equals its expected cash flows discounted at the appropriated costs of capital. Thus, to increase firm value, management can engage in activities to increase the expected cash flows and/or to lower the cost of capital. Theories for incentives of hedging, therefore, build on market imperfections and focus on situations that hedging can increase the expected cash flows.

This chapter examines the literature on hedging theory, and theoretical association between exposures and the use of derivatives. The aim of this chapter is to identify characteristics that theories suggest may determine a firm's decision to use derivatives, and then affect firm value. This review will ultimately opt the concentration of research in this thesis. Particularly, findings of this chapter will be employed in the latter empirical chapters to identify hypotheses testing the case of non-financial firms in eight East Asia countries.

The chapter begins with discussion of derivatives use with risk management and examines whether empirical literature shows that derivative instruments are used for hedging or speculation. Then it looks at overview of baseline theories, that is to say Modiglian-Miller theorems. This is followed by a review of hedging theory, and a look at theoretical relation between derivatives usage and exposures. Finally, the chapter concludes.

2.2. Derivatives use, hedging and speculation

2.2.1. Risk management, hedging and derivative usage

Smith *et al.* (2001) defines risk management as the process of assessing and modifying many trade-offs between risk and reward that face a firm. These trade-offs can be evaluated based on whether they are done for purpose of hedging, speculation or arbitrage. Focusing on instruments of risk management, Hillier, Grinblatt and Titman (2012, p.684) interpret risk management to be a process that "entails assessing and managing, through the use of financial derivatives, insurance, and other activities, the corporation's exposure to various sources of risk". Bekaert and Hodrick (2011, p.590) even define risk management "is the use of derivatives to take positions in financial markets that offset the underlying sources of risks that arise in a company's normal course of business". Consequently, most of extant literature considers "risk management", "hedging" and "derivative use" as synonyms.

So, how is hedging defined? In the fact that hedging comes in many different forms. Smith and Stulz (1985, pp.392) use a quite general definition of hedging, where firm's value is preserved regardless of any state changes. In their words, "a firm can hedge by trading in a particular futures, forwards, or option market…" and "hedging reduces or eliminates the dependence of firm value on changes in state variable". They also suggest that a firm can hedge through its operating strategies; for instance, a merger can produce effects similar to those of hedging via derivatives. According to Smith *et al.* (2001, pp.3), actions taken to reduce risk are known generally as hedging, and the broader use of the term "hedging" applies to options as well as forwards, futures, and swaps.

All these above explanations support the argument of Lievenbruck and Schmid (2014) that hedging is always interpreted as the use of any derivative contract aimed to eliminate or reduce

an open market risk position. Hence, the terms “hedging” and “derivative use” are used interchangeably. On the other hand, Guay and Kothari (2003) emphasize the importance of considering a multifaceted approach to hedging as their study find evidence that the use of derivatives by many U.S non-financial firms is too small relative to their risk exposures, they point out that using derivatives to “fine tune” firms’ overall risk management program which likely cover other means of hedging, so they argue that derivatives use is a noisy proxy for firms’ risk management activities. However, the empirical studies on hedging from earlier to date have been adopting derivatives use to measure hedging activities. Most of earlier studies investigate the determinants of corporate hedging by conducting surveys (e.g., Nance, Smith, and Smithson, 1993; Dodle, 1993; Berkman, Bradbury, and Magan, 1997; Hakkarainen, Kasanen, and Puttonen, 1997).

Over the last decades, when firms in many countries have been encouraged to disclose information about their hedging policies and their methods of hedging in their annual reports, empirical studies collect data of derivatives use from firms’ annual reports. It is possible for empirical studies to employ quantitative data on the use of derivative to measure the “extent of hedging” or how much firms hedge. Some empirical studies use fair value of derivatives such as Berkman and Bradbury (1996), Spano (2007), but most of researchers use notional value of derivatives as proxy for extent of hedging (e.g., Nguyen and Faff, 2002; Guay and Kothari, 2003; Campello *et al*., 2011; Lel, 2012).

2.2.2. Speculation and derivatives use

Together with hedging, speculation is the main types of activity taken by participants in the derivative markets. Smith *et al.* (2001, pp.6) interprets speculation as an action to increase expected reward, even though it increases the degree of uncertainty about achieving that

outcome. The Commodity Futures Trading Commission (2006) interprets speculation as action of not hedging, but trading with the objective of making profits through the successful expectation of price movement.

From these general understanding, hedging and speculation are considered as opposite sides of a risk management coin. However, hedging and speculation, in their purest sense, are more like endpoints on a continuum of risk management. At one end of the continuum, one can regard hedging a situation where hedgers enter into a derivative position with anticipation that they can perfectly remove any exposure in a physical market position. At the other end are the pure speculators taking a derivative position that exposes them to market risk that they otherwise do not hold (Kolb and Overdahl, 2010). Therefore, a crucial issue whether studies on derivatives use have been measuring hedging or speculation. If the incentives of hedging and speculation are correlated, it is sometimes not easy to distinguish hedging from speculation.

To determine whether firms use derivatives for hedging or speculation, researchers find considerable evidence that firms use derivative for hedging. Bodnar and Gebhardt (1999), Bodnar *et al.*, (2008), among others, survey and find that firms in different countries use types of derivatives such as forwards, options, futures, and swaps for hedging purposes. Replacing surveys with empirical analysis, Bartram *et al.* (2011) show that that 90% companies of Fortune 500 use derivatives for risk management, not for speculation. Supporting that finding, Allayannis, Lel, and Miller (2012) also demonstrate that well governed firms from 39 countries in their sample from 1990 to 1999 are more likely to use derivatives to hedge rather than to speculate.

Judge (2006) suggests that a far better approach to determine whether firms hedge or speculate is measuring a firm's risk exposure and then investigate the impact of derivative usage

on this exposure. Remarkable studies on exposures and the use of derivatives (e.g., Allayannis and Ofek 2001; Nguyen and Faff, 2003; Bartram and Bodnar, 2007; Treanor *et al*., 2014) find that there is negative association between them, suggesting that firms use derivatives to hedge rather than to speculate in the markets.

In short, although firms can use derivatives for the purposes of hedging or speculation, both evidence from surveys and empirical analyses indicate that most of firms in fact are hedging and using derivatives for this purpose. Furthermore, even though there remain subtle differences in exact meanings of "risk management", "hedging" and "derivative use", in this thesis, we do not distinguish these terms and use them interchangeably.

2.3. A review of the the Modiglian-Miller Theorems

Dufey and Srinivasulu (1984) summed up the arguments of modern theories that oppose hedging at the firm level were that "risk does not exist; even if it exists, it needs not be hedged; even if it is to be hedged, corporations need not to hedge it". A convenient starting point in discussion the conditions under which firms hedge and hedging can add value is Modigliani and Miller (MM) theorem on corporate finance and optimal capital structure, that inspired many improvements in finance.

Under assumption that financial markets are perfect, Modigliani and Miller (1958) argue that firm's financial policies and strategies become irrelevant and have no influence on the firm's market value. Modigliani (1980) states that "with well-functioning markets (and neutral taxes) and rational investors, who can "undo" the corporate financial structure by holding positive or negative amounts of debt, the market value of the firm- debt plus equity- depends only on the income stream generated by its assets. It follows, in particular, that the value of a firm should not

be affected by the share of debt in its financial structure or by what will be done with the returns-paid out as dividends or reinvested (profitably)".

The use of derivatives or hedging policy is a part of a firm's financial policies, thus, MM theorems can be extended to the treatment of derivative uses or hedging. In the context of hedging, it implies that hedging is inessential, as an investor can do what the firm does. Specifically, if an investor can sell or buy on the similar terms as the firm does, or he/she can make "homemade hedging" for his or her own account, then the corporate hedging policy becomes irrelevant. On the other hand, because value is created on the asset side of the balance sheet, namely through the positive NPV projects, hedging as a component of firm's financial policies can not create value per se (Judge, 2001).

2.4. Hedging theory

The academic perspective to hedging conventionally accepts the propositions of MM theory as the baseline model, but then proceeds to identify sets of conditions that justify hedging when the restrictive assumptions are relaxed. The conclusion is that hedging can add value, in theory, if there are market imperfections that make a firm's profit function convex in some states. According to Froot, Scharfstaein, and Stein (1993), this is necessary condition for hedging to increase firm value because volatility will be costly under such circumstances.

The research on hedging theory can be categorized into a few mainstreams. In Tufano (1996) view, the two main streams of incentives to hedge include maximization of shareholder value and maximization of managerial utility. The former may consist of motivations related to market imperfections such as convex tax function, financial distress costs, underinvestment costs, and economies of scale. The latter may include market imperfections related to information asymmetry and managerial risk aversion. Schrand and Unal (1998) classify the

research on hedging by focusing on the practicality of hedging studies that investigate the need and cost of hedging. Following them in this section, we will review the theoretical rationales of value creation through hedging, each of which is associated with cost reductions for one type of market imperfections.

2.4.1. Bankruptcy costs and costs of financial distress

Bankruptcy costs are defined as the costs incurred as a result of a bankruptcy fillings (Stulz, 2003). Stulz (2003) argues that the degree to which bankruptcy costs affect firm value depends on their extent and on the possibility that the firm will have to file for bankruptcy. More specifically, Warner (1977) demonstrates that leveraged firms are exposed to risk that their cash flows are not sufficient to make all fixed payment in a timely manner and in full. The higher leverage or more volatile cash flows, the higher this risk increases. A company that is unable to execute its fixed payment obligations is forced into bankruptcy. Additionally, in the fact that firms encounter many of bankruptcy costs as soon as its financial situation becomes unhealthy, even before it actually files for bankruptcy or even if the firm never files for bankruptcy or never default. These costs are called financial distress costs.

Mayer and Smith (1982) point out that although evidence of Warner (1977) argues that in a large firm even transactions costs associated with bankruptcy (financial distress cost) are a small portion of assets, it will be sufficient to induce firms to hedge if the present value of a reduction in expected bankruptcy costs is greater than the present value of the contract's loading fees.

The probability of encountering financial distress is determined by two factors. The first one is that the larger the ratio of fixed claims of a firm relative to its cash flows, the higher the probability of incurring financial distress. The second one is that if a firm's cash flow is more volatile, it is more likely for that firm to encounter financial distress. Therefore, by reducing

volatility of cash flows, hedging lowers the probability of financial distress, and in turn lowers the expected financial distress costs. This reduction in expected costs increases the firm's expected cash flows, hence increasing firm value. Consequently, firms with high probability of bankruptcy costs and costs of financial distress will be more likely to hedge.

2.4.2. Corporate taxes

Mayer and Smith (1982) and Smith and Stulz (1985) argue that with progressivity in the tax schedule, and after-tax incomes are convex, hedging will reduce expected taxes if a firm's effective tax schedule is convex, and the more convex the effective tax schedule, the larger the reduction in expected taxes, and then increases after-tax cash flows and value. In addition, Mayer and Smith (1982) show that there are some provisions in the tax code having the effect of changing the firm's effective marginal tax bracket so that hedging is favored. The structure of the tax code can make it beneficial for the firms to take positions in futures, forward, or option markets. If effective marginal tax rates on firms are a progressive function of the firm's pre-tax value, the after-tax value of the firm will be a convex function of its pre-tax value. If hedging reduces the volatility of pre-tax firm value, then lowering the expected corporate tax liability, hence the expected after-tax value of the firm is increased, as long as the cost of hedging is not too large (Smith and Stulz, 1985)

Furthermore, the progressive tax structure has generally created a convex statutory tax function for firms. The greater progressivity, the more convex tax function. As Nance *et al.* (1993) indicate that although the statutory progressivity specified in the corporate profit tax allies over a relatively small range of taxable income, firms with more of range of their pretax income in the progressivity region of tax schedule have greater tax-based incentives to hedge. Therefore, a greater convexity of tax schedule should lead to a higher possibility of hedging.

However, Mayers and Smith (1990) point out that statutory progressivity is comparatively limited in most of tax systems, but indirect effects can give rise to convex tax function. Most often, these indirect effects come through tax preference items such as tax carry-back, tax loss carry-forwards, investment tax credits and foreign tax credit. In particular, Géczy, Minton, and Schrand (1997) indicate that tax preference items, which are deducted from pre-tax income, indirectly create convexity in the tax liability and concavity in the value of firm, because the present value of unused preference items reduces as they are carried forward to the future periods. Hedging reduces variance, thereby increasing the expected value of tax benefits because the probability of using preference items increases with the level of a firm's taxable income.

2.4.3. Agency cost of debt

Agency costs were first introduced to corporate finance theory by Jensen and Meckling (1976)'s seminal paper. They argue that agency cost may arise from conflicts between shareholders and debt holders, and such investments lead to a decrease in value of the debt. Consequently, prospective lenders persist in legal safeguards to protect them. Costs involved in monitoring actions of shareholders are one type of agency costs. It is likely that these costs are borne by equity holders in terms of higher interest rates required by creditors. In such way, other things are equal, the higher the expectation of monitoring costs by creditors, the higher interest rates, and the lower the firm value to shareholders. Thus, they indicate that firms have motivations for mitigating agency costs to maximize the current market value of the firm.

A somewhat argument correlated to Jensen and Meckling (1976)'s agency costs is the underinvestment analysis of Myers (1977). He finds out the underinvestment problem by noting that shareholders can reject positive net present value projects, when the debt is risky and the probability of financial distress is high. Such a loss due to underinvestment is considered as a

type of agency costs connected to the corporate leverage. In addition, Jensen (1986) also builds an agency costs model, which is based on conflicts of interests between shareholders and managers. He argues that conflicts between shareholders and managers can create a free cash flow or overinvestment problem because managers might have motivations to invest in negative net present value projects to avoid distributing excess cash flow back to shareholders.

According to Dobson and Soenen (1993), there are three reasons why firm's managers should increase firm value by reducing agency costs through hedging. Firstly, hedging reduces volatility of cash flows by smoothing the cash flow streams, thereby lowering the firm's cost of debt. Because agency costs are borne by managers, supposing that there is asymmetric information between managers and bondholders, hedging will increase the firm value. Consequently, managers will rationally induce to hedge. Secondly, given that debt financing exists, cash flow smoothing through hedging will tend to reduce the risk-shift as well as the underinvestment problems. Finally, hedging reduces the possibility of financial distress and increases duration of contractual relations between shareholders and managers. By strengthening corporate reputation acquisition, hedging directly reduces the moral-hazard agency problem.

In short, given that hedging is a value-enhancing activity by reducing agency costs, the agency cost hypothesis expect that firms with more investment growth opportunities and financial constraints are more likely to hedge.

2.4.4. Other factors

In addition to the above rationales, several factors have been identified being related to derivatives use in prior empirical studies. These factors consists of economies of scales, and substitutes hedging with derivatives

2.4.4.1. Economies of scales

Even though there is no theoretical model investigating the relationship between hedging and economies of scale, several arguments from empirical studies have provided a link between them (e.g., Warner, 1977; Nance *et al.*, 1993; Rajan and Zingales, 1995). Many prior studies suggest that firm size is a good proxy for economies of scale.

Nance *et al.* (1993) argue that the probability of encountering financial distress is directly related to the size of the firm's fixed claims relative to the value of its assets. Therefore, firm size affects firm's motivations to hedge. There are competing arguments about relationship between firm size and the probability of using derivatives, some researchers argue that smaller firms are more likely to hedge than larger firms, because financial distress can result in bankruptcy, restructuring, or liquidation, or circumstances that the firm encounters direct legal costs. While direct costs of bankruptcy are less than proportional to firm size, so it implies that smaller than are more prone to hedge than larger firms (Warner, 1977). On the other hand, smaller firms have more incentives to hedge because it is likely that they have taxable income in the progressive region of the tax schedule. In addition, large firms have fewer motivations to pursue hedging than small firms as they may encounter a lower probability of financial distress as they are enabled to diversify (Rajan and Zingales, 1995).

However, Nance *et al.* (1993) point out some explanations for positive relationship between firm's size and hedging. The first reason is that there are economies of scales in transaction costs related to derivatives use that makes it cheaper for larger firms to hedge. Large firms can be advantageous to these economies of scales, because they are more likely to employ professional managers with the specialized information to manage a hedging program (Block and Gallagher 1986; Booth, Smith, and Stolz, 1984). Second, as the derivative markets exhibit significant scale

economies in the structure of transactions costs, implying that large firms have more motivations for hedging.

2.4.4.2. Substitutes to hedging with derivatives

The preceding studies show that a firm's decision to use derivatives is also affected by other financial policies. Three substitutes to hedging with derivatives consist of natural hedging, the dividend policy and liquidity, and diversification.

In terms of natural hedging, Nance, Smith and Smithson (1993) is the first to discuss the usage of preferred stocks and convertible debt as substitutes to hedging with derivatives. They argue that preferred stocks and convertible debt will reduce the demand for using derivatives, as they do not cause the underinvestment problem related to the use of straight debt. This is because convertible debt involves an embedded option on the firm's assets, which makes this liability more sensitive to changes in firm value, and thereby reducing the sensitivity of equity to changes in the value of the firm. In the same manner, preferred stocks decrease the probability of financial distress due to periodic dividend payment, instead of paying interests like debts.

A firm's incentive to hedge with derivatives can also be influenced by its dividend policy and liquidity. Nance *et al.* (1993), and Berkman and Bradbury (1996) suggest that dividend payout will have an impact on derivative use due to hesitance to cut dividends and the implication of dividend payments for debt financing. They also point out that the degree of liquidity of a firm's assets influence its extent of using derivatives, as there is an inverse relationship between liquidity and risk.

Finally, diversification is considered as a substitute to hedging with derivatives, as through diversification firms can reduce both their business and financial risks. In the model of Stapleton (1982), firms diversified across lines of business may already have a low volatility in operating

income, with only a small benefit from hedging with derivatives, so they need lower extent derivatives to hedge.

2.5. Theoretical association of derivatives use and exposures

Géczy *et al.* (1997) demonstrates that market imperfections create incentives to hedge, but they are not sufficient conditions for derivatives use. A decision to use derivatives also depends on the extent of exposure and the costs of hedging. This is because a high degree of volatility of financial prices can be related to lower firm valuations as it reduces the expected value of future cash flows in a world with market imperfections (Rawls and Smithson, 1990). Froot *et al.* (1993), among others, show that as cash flow volatility not only magnifies the probability that a firm will need to access capital markets, but also increases the costs of doing so. Thus, it lowers the level of investment and result in decreasing the firm value. Consequently, firms with volatile cash flows or greater portions of their revenue exposed to the financial price risks might be more beneficial from hedging activities.

Shapiro (1975) is the first scholar to officially model the relationship between firm value and exchange rate fluctuations. His two-country model predicts that the impacts of local currency devaluation on firm value can only be measured by examining the total effect of devaluation on future cash flows, because a depreciation in local currency leads to a reduction in a firm's cash flows, thereby decreasing the value of that firm. Elaborating on Shapiro (1975)'s work, the model developed by Dumas (1978) highlights the importance of decisions to hedge against exchange rate risk by a firm in a multi-currency world. He argues that the decision to hedge exchange rate risks, by using forward contracts or other derivatives contracts, becomes a major financial decision to maximize firm value in the world with different currencies.

Using the two-country model as Dumas (1978), but Hodder (1982) emphasizes the domestic aspects of exposure. In the model, exchange rate exposure is divided into: domestic price related exposure, foreign real asset exposure, and inflation-related exposure. He shows that in order to eliminate these exposures, a firm can undertake hedging by using forward contracts or other derivatives contracts, besides foreign borrowing. And hedging activities can be applied to multinational corporations, importers, exporters and purely domestic firms as well.

On the other hand, Alder and Dumas (1984) first attempt to measure exposure as a regression coefficient and point out how hedging can reduce exposures. They indicate that exposure to exchange rate risk is not intrinsically different from that of exposure to other market risks such as interest rates and commodity price risk. Thus, they suggest that identifying and hedging large exposures to exchange rate risks and other market risks can result in a reduction in perceptions of default risks, an improvement in bond ratings and lowering borrowing. In a subsequent paper, Bodnar *et al.* (2002) develop a duopoly model of exporting firms under imperfect competition to study the relationship between exposure and firm value. They show that exposure to exchange rate risk would be reduced if the exporter uses hedging activities.

2.6. Institutional theory approach and hedging

The institution-based view argues that a network of firms is a coordinated system of value-added activities whose structure is determined by the institutions that control or affect firms' objectives and behaviors (Dunning, 2003). North (1990, 1994) was among the first to emphasize the importance of institutions. He considers institutions much more than background conditions and defines institutions as "rules of the game," including the formal rules (laws, regulations) and informal constraints (customs, norms, cultures) that organizations face. Institutions shape firm actions by determining transaction costs and transformation costs of production. As such,

institutions play a key role in determining the organizational outcomes and effectiveness of organizations (Khanna and Rivkin, 2001) as well as framing their organizational strategic choices (Peng, Lee, and Wang, 2005).

Therefore, to better understand the determinants of firms' activities and their effects, it is necessary to consider institutional influences inside the firm and the external environment where firms operate simultaneously. Dunning and Lundan (2008) introduce a theoretical framework in the context of the OLI paradigm (Dunning, 1988) in order to accommodate both firm- and country-specific considerations. The *ownership* advantages (O) in the OLI paradigm now include institutional ownership advantages (Oi), which comprise the firm-specific characteristics and an indentation of the institutional environment (L attributes) (Cantwell, Dunning, and Lundan, 2010). On the other hand, the institutionally related *location* advantages of countries (Li) allow for the interdependence between the firm and national institutions on both the micro and macro levels.

Regarding the literature on hedging, although studies on traditional hedging theories are abundant, few empirical studies have investigated the link between differences in cross-country characteristics and firms' use of derivatives. Furthermore, the findings of these studies provide mixed evidence. For example, Lievenbruck and Schmid (2014) together with Lel (2012) obtained a significant association between GDP per capita and the use of derivatives in the predicted directions, although Lievenbruck and Schmid only found supporting evidence in the case of commodity price derivatives use. The effect of financial risk is always statistically significant but inconsistent with the hypothesized prediction (see Bartram *et al.,* 2009). Likewise, regulatory quality and long-term interest rates are insignificant, while the effect of inflation rate

and long-term exchange rate are very weak (see Bartram *et al.*, 2009; Livenbruck and Schmid, 2014).

Our study explores countries with great variances in terms of economic, political, and social environments. Hence, we expect to observe differences in derivatives use due to the differences in governance mechanisms.

According to Globerman and Shapiro (2003), governance mechanisms consist of institutions and policies targeting economic, legal, and social relations. Good governance mechanisms value "independent judiciary and legislation, fair and transparent laws with impartial enforcement, reliable public financial information and high public trust" (Li, 2005, pp.298). As such, good governance mechanisms are able to reduce transaction, production, and R&D costs, leading to reductions in the variability of firms' profitability and high-return, low-risk investments (Ngobo and Fouda, 2012). They implement policies that favor free and open markets and form effective and non-corrupt institutions (Globerman and Shapiro, 2003). On the contrary, poor governance mechanisms increase costs and uncertainty (Cuervo-Cazurra, 2008), and they can lead to smaller, more volatile, and less liquid stock markets in emerging economies (Lin *et al*. 2008) as well as a lack of transparent financial data and other information on firms and a shortage of specialized financial intermediaries (Khanna, Palepu, and Sinha, 2005).

In this study, we focus on an important aspect of governance mechanisms, that is corruption. While the concept of corruption is widely studied in the economics and international business areas, to our knowledge, there is currently no research linking corruption with derivatives use in the literature. Bardhan (1997), Quazi (2014), and others view corruption as a "grabbing hand," because it increases uncertainty and transaction costs, and one major cause of corruption is bad governance mechanisms (Lambsdorff, 2006). When it is costly to transact, institutions matter,

and when institutions matter, it is costly to transact (North, 1993). Thus, firms in highly corrupt countries may face higher transaction costs due to bribe payments and related expenses (Brouthers, Gao, and McNicol, 2008), which in turn leads to higher hedging costs. Along this line, abundant empirical evidence indicates that corruption directly deters economic growth and development, causing the business environment to become more uncertain and less favourable for profit making and firm performance (e.g., Lee and Hong, 2012; Petrou, 2015).

Furthermore, although up to date the existing literature has been silent about the influence of corruption on value effects of derivatives use, some researchers (e.g. Venard and Hanfi, 2007; Foss, 2010; Petrou, 2014, among others) observe that firms' exposure to corrupt countries in their business operations may translate to real financial losses for them. More clearly, firms that operate in countries with a high level of corruption are likely to engage in costly market transactions and less efficient transformation because that country is likely to have lower quality of infrastructure services, economic growth and financial stability (Rose-Ackerman, 1978, 1999). The existing literature also shows that a higher level of corruption is associated with higher borrowing cost, worse corporate governance, and lower stock valuation. In their analyses, Donadelli, Fasan, and Magnanelli (2014) evidence that firms operating in highly corrupt countries tend to have relatively low returns. While those firms operating in countries with lower level of corruption can capitalize on the advantages generated by a more favorable institutional context for firms, which in turn has a positive influence on performance and profitability of firms (Levy and Spiller, 1994; Bergara, Henisz, Spiller, 1998).

2.7. Conclusion

This chapter begins with discussion about the use of derivatives. The discussion shows that firms can use derivatives for both hedging and speculation, but empirical studies on derivatives

usage present the evidence that most of firms using derivative to hedge rather than to speculate. In addition, although there is differences in the exact meanings of the terms “risk management”, “hedging” and “derivatives use”, arguments and explanations of extant literature indicate that these terms can be used interchangeably.

The chapter then presented the MM theory. Starting with assumption that the capital markets are perfect, the theory argues that there is no risk, even there is risk, firms do not need to hedge, and if the firms hedge, hedging does not add value to the firms. Hedging theory relaxes the perfect market assumptions, and shows that if there are market imperfections, hedging can add value to the firms. Theory suggests that hedging can increase the firm value because (1) hedging reduces the probability that firms encounter bankruptcy and financial distress, thereby lowering the expected costs of bankruptcy and costs of financial distress; (2) hedging can reduce the tax burdens for a firm with a convex tax schedule and/or having tax preference items; (3) hedging reduces agency costs arising from conflicts of interests between shareholders and managers, agency costs associated underinvestment, overinvestment and enhances the firm’s ability to finance future potential investment projects. In addition, this chapter demonstrates that firm’s motivations for hedging also depend on the economies of scales, and substitutes to hedging.

Finally, this chapter discusses the theoretical association between derivatives use and exposures. The models of Shapiro (1975), Dumas (1978), Alder and Dumas (1984), among others, show that exposures to market risks make firm’s cash flows volatile, leading to lowering the value of the firm. However, hedging, especially hedging with derivative instruments, can eliminate the variability of cash flows and reduce costs of financial distress and bankruptcy costs associated with exposures, so hedging is a value-enhancing activities.

In general, these above mentioned theories and arguments provide explanations for a firm's demand for using derivatives, identify relationship between the benefits of derivatives use with various firm-specific characteristics and country-specific characteristics as well. They also point out the testable ways and channels that the use of derivatives can reduce exposures to market risks and add value to a firm.

CHAPTER 3

REVIEW OF EMPIRICAL LITERATURE

3.1. Introduction

Chapter two reviewed hedging theory and theoretical relationship between the use of derivatives and exposures, which all provided useful insights and determinants of a firm's decision to use derivatives. In the past few decades, many empirical studies have been conducted to examine incentives of derivatives usage and to evaluate effects of hedging on firm value and exposure by operationalizing various theoretical predictions into empirical testable implications. However, the existing evidence on determinants of hedging is not quite consistent among these studies.

This chapter examines the extant literature, which has focused on testing the various theories of value creation through hedging, and the extent to which it supports or refutes them. Following Aretz and Bartram (2010), we present and discuss the empirical evidence by reviewing the proxy variables used to test these hypotheses. The findings of this chapter will help to opt how these theories have been assessed in the empirical literature and whether the theories underpin what is observed in practice.

In addition, this chapter surveys the extensive literature examining the relationship between derivatives uses and firm value. Allyannis, Lel, and Miller (2012) indicate that most of prior work has focused on the unconditional effect of derivatives use on firm value and has found mixed results; and they employ a conditional test. Based on their idea, we classify prior empirical studies into 2 categories, unconditional analyses and conditional analyses.

Furthermore, the chapter provides comprehensive review of studies on association between derivatives usage and exposure. Some studies analyze the relationship between derivatives use and exchange rate exposures, whereas some studies scrutinize derivatives usage in association with other different types of exposures. We will highlight and discuss the main findings emerged in those studies.

We divide the empirical literature review into two main parts, in which the first part covers the studies outside East Asia, and the second part surveys studies on derivatives use in the East Asia countries. In each such sub-part, we review studies on determinants of derivatives uses, derivatives use and firm value, and the use of derivatives and exposures, separately.

The remainder of the chapter is organized as follows. Section 2 reviews empirical studies outside East Asia. Section 3 surveys the empirical studies in East Asia. Finally, the chapter concludes.

3.2. Empirical studies outside East Asia

3.2.1. Determinants of derivatives use

This section surveys papers that tested empirically hedging theory, which were presented in the chapter 2, in countries outside East Asia over a few last decades from 1993 to present by analyzing their evidence through reviewing the most commonly used proxy variables.

(INSERT TABLE 3.1 HERE)

3.2.1.1. Bankruptcy costs and costs of financial distress

To test the hypothesis of bankruptcy and financial distress cost, empirical studies over the last few decades have been using many proxies to measure the likelihood of these costs. Leverage is the most popular proxy, as financial distress is more pronounced with more debt in a

firm's capital structure, so a firm with higher leverage is more prone to hedge. As shown in the table 3.2, twenty out of twenty four papers use this variable, but there is not clear-cut evidence. In spite of finding that leverage is statistically significant, Chen and King (2014), Lievenbruck and Schmid (2014), among others, present evidence of positive relationship between leverage and derivatives usage, while other researchers such as Afza and Alam (2011) find the negative association between them. On the other hand, Gay, Lin, and Smith (2011), Lel (2012) show that leverage has no effect on firm's decision to use derivatives, as the coefficient of this variable is positive but insignificant.

Besides leverage, many studies employ interest coverage ratio and debt ratio to present the probability of financial distress and bankruptcy. Most of studies (e.g., Chen and King, 2014; Kumar and Rabinovitch, 2013; among others), find out a positive relationship between debt ratio and derivatives use and negative effect of interest coverage ratio on derivatives usage. These findings imply that firms with higher debt ratio and/or lower interest cover ratio are more likely to use derivatives to lower costs of financial distress. On the contrary, Spano (2007), Charumathi and Kota (2012) indicate that these factors do not influence the firms' decisions on using derivatives.

In similar fashion, some studies propose the profitability, which is estimated as gross margin and ratio of earnings to total assets (ROA), as a measure of financial distress. A firm with lower gross margin and/or ROA is likely to use more derivatives because it has more difficulties in meeting its payment obligations and higher risk of insolvency. However, the empirical evidence is unclear. Chen and King (2014), Afza and Alam (2011) find supporting evidence for this argument, while Lievenbruck and Schmid (2014) find out the opposite association, and Aabo and Ploeen (2014) indicate that ROA has no impact on derivatives use. Especially, Clark and Judge

(2008) employ tax loss carry forwards as a proxy for profitability as it presents the existence of net losses, but they find weak evidence that it is positively related to derivatives usage.

Firm size is also widely used in the extant literature. Nance *et al*. (1993) state that a firm's probability of financial distress is directly connected to the size of firm's fixed claims relative to value of its assets. Although the direction of relation between firm size and derivatives usage is ambiguous, the overall evidence of empirical studies gives strong support for the view that the larger a firm, the more derivatives the firm uses to reduce costs of financial distress and bankruptcy (Aabo and Ploeen, 2014; Júnior, 2013; Gay *et al.*, 2011).

The judgement of other market participants about a firm's survial chances may predict the likelihood of financial distress and bankuptcy. As such, a firm with lower credit rating may induce to use more derivatives. Chen and King (2014) employ Altman's Z-score, while Judge and Clark (2008) use Qui-score as proxy for credit rating, and Sprcic and Sevic (2012) use dummy variable. Although all researchers find that credit rating is a determinant of firms' decision on using derivatives, the effect for this variable is mixed. Chen and King (2014), Judge and Clark (2008) obtain the evidence that firms will use more derivatives to alleviate financial distress when they obtain lower credit rating, but Sprcic and Sevic (2012) indicate that the higher credit rating, the more derivatives use by non-financial firms in Croatia.

In general speaking, the existing evidence provides mixed support for the hypothesis of bankruptcy costs and financial costs. Testing the case of non-financial firms in UK, Judge (2006a, 2006b) finds a strong relationship between financial distress costs and foreign currency hedging decision, which is much stronger than many previous studies in the U.S. Recently, Chen and King (2014) examine 1832 U.S non-financial firms and present evidence consistent with financial distress cost arguments. In contrast, Géczy *et al.* (1997), Charumathi and Kota (2012)

state that there is no evidence supporting this hypothesis. Especially, Guay and Kothari (2003) suggest a need to rethink the past empirical research on firms' derivatives use.

(INSERT TABLE 3.2 HERE)

3.2.1.2. Corporate taxes

Empirical studies employ variables measuring for tax convexity, and tax preference items as proxies for testing tax argument. Nance *et al.* (1993), and Mian (1996) use progressivity dummy when investigating derivatives use of 169 non-financial firms of Fortune 500, and 3022 firms from Compustat and Narrs. However, they do not find any evidence supporting this hypothesis when progressivity dummy variables are insignificant at any confidence levels.

Furthermore, to assess whether the taxable income of a firm is in convex region of the tax schedule, marginal tax rates and tax charges to market value are used as proxies and these proxies lead to mixed results. Kumar and Rabinovitch (2013) present evidence of a positive association between marginal tax rates and the use of derivatives, while Spano (2007) shows that firms use more derivatives to alleviate tax burden when its ratio of tax charges to market value is lower.

In addition to statutory progressivity, tax preference items such as tax loss carry forwards, foreign tax credits, and investment tax credits also make tax function more convex. The most commonly used variable is tax loss carry forwards, but the evidence is inclusive. Judge (2006a) finds strong evidence that the greater the tax loss- carry -forwards, the more derivatives firms use to reduce tax burden. Whereas Géczy *et al.* (1997) do not find any supporting evidence for this variable in both univariate and multivariate tests. Alternatively, Afza and Alam (2011), among others, employ dummy variable to denote the availability of tax loss carry forwards. However, only study by Supavanij and Strauss (2010) shows that this variable has significantly positive

effect on derivatives use. In contrast, Gay *et al*. (2011) indicate that firms with more tax loss carry forwards have less incentive to use derivatives. Additionally, Sprcic and Sevic (2012) employ total value of tax loss carry forwards and tax loss carry backs to total assets, but they also do not find any statistically significant evidence.

Overall, most studies find some evidence supporting tax incentive argument, especially, the empirical evidence based on tax preference items and assessment of taxable income. Supanvanij and Strauss (2010) find that tax loss carry forwards is important factor in determining the use of foreign currency derivatives, while Kumar and Rabinovitch (2013) indicate that foreign tax credits are in the direction hypothesized and firms use derivatives to increase the present value of tax losses. In contrast, Sprcic and Sevic (2012) finds that the evidence in favor of the tax hypothesis is very weak, while Gay *et al* (2011) do not find any evidence in support of the tax incentive to increase debt capacity.

(INSERT TABLE 3.3 HERE)

3.2.1.3. Agency costs of debt

Most often, proxy measures growth opportunities is market to book ratio (or book to market value). The theory hypothesizes that firms with higher market to book ratio have more incentives to use derivatives to reduce agency costs of debt, however, large body of empirical studies do not find evidence consistent with the theoretical prediction. While Supanvanij and Strauss (2010), among others, present a significantly negative association between this variable and the use of derivatives, Júnior (2013) finds out a significant relationship but at opposite direction. In contrast, from earlier studies such as Guay and Kothari (2003) to recent studies (e.g., Chen and King, 2014; Lievenbruck and Schmid, 2014; Aabo and Ploeen, 2014) show that market to book ratio is not a determinant of derivatives use.

However, empirical results intensely support the hypothesized relation between R&D expenditures, the second most popular measure for growth opportunities, and the use of derivatives (Aabo and Ploeen, 2014; Spano, 2007; Allayannis and Ofek, 2001; Géczy *et al.*, 1997). R&D expenditures provide a reasonable indicator of future project development (Triki, 2005). Hence, higher R&D expenditures indicate higher availability of growth opportunities, implying a higher propensity of hedging. In the same fashion, Gatopoulos and Louberge (2013) use capital expenditure, while Sprcic and Sevic (2012) employ investment expenditures as proxies of a firm's growth opportunities. Both studies exhibit results consistent with theory agrument, suggesting that firms with more capital expenditures or investment expenditures hedge more agency cost of debt by using derivatives.

With respect to the more indirect measure of growth opportunities, the earnings to price ratio (E/P ratio) is served as a proxy in several studies. Firms with low earnings but high share price seem to obtain most of their value from profitable expansion opportunities, thus E/P ratio and the use of derivatives should be negatively associated (Aret and Bartram, 2010). This proxy provides strong support for the hypothesis of agency cost of debt in the study of Berkman and Bradbury (1996), Adedeji and Baker (2002). By contrast with these findings, recent study by Charumathi and Kota (2012) indicates that E/P ratio does not affect the firm's decision to use derivatives.

Furthermore, firm's investment opportunities can be tested by employing liquidity variable. Firms are more prone to forgo positive present value projects or encountering underinvestment problem when their cash flow holdings are low, thus higher liquidity should lead to higher probability of using derivatives. Nguyen and Faff (2002) evidence a significantly postive relation between that variable and derivative use. Additionally, Allayannis and Ofek (2001) use dividend

as alternative proxy, but they do not find any significant relation between that variable and the use of derivatives.

Agency cost of debt theory also argues that firms use derivatives to lower agency costs related to overinvestment problems. To evaluate that relationship Lel (2012), Fauver and Naranjo (2010) use free cash flow ratio as proxy on the ground that overinvestment problem is more observable in the case of firms with larger free cash flows and fewer investment opportunities. Empirical evidence strongly support that free cash flow ratio is a significant determinant of derivatives usage. However, if Fauver and Naranjo (2010) present a positive relationship between them consistent with theory prediction, Lel (2012) indicates that lower free cash flow result in higher likelihood of hedging by derivatives.

In terms of financial constraints, the empirical studies support the hypothesis that financial constraints should lead to higher propensity for using derivatives to alleviate agency cost of debt. These tests are based on leverage and gearing variables (Chen and King, 2014; Judge, 2006), or profit margin (Bartram, Brown, and Fehle, 2009). Evidence from these studies highly support that they are determinants of firms' derivatives use.

To sum up, empirical studies on testing the agency cost of debt theory provide inconclusive evidence. The evidence to support the underinvestment cost theory can be found in Chen and King (2014), Gatopoulos and Louberge (2013), Fauver and Naranjo (2010), among others. However, investigating 121 large Indian non- financial companies, Charumathi and Kota (2012) indicates that the agency cost of debt hypothesis fails to provide convincing evidences in predicting a firm's derivative use. This finding is consistent with recent study by Lievenbruck and Schmid (2014), and earlier studies such as Nance *et al.* (1993), and Tufano (1996).

(INSERT TABLE 3.4 HERE)

3.2.1.4. Economies of scale

As mentioned in the chapter 2, up to date there is no theoretical model investigating the relationship between hedging and economies of scale, but many prior studies use firm size as good proxy for economies of scale, although an association between firm size and hedging is still indeterminate.

In spite of different measures of firm size, many empirical studies figure out that larger firms have more motivations to use derivatives (e.g., Lievenbruck and Schmid, 2014; Aabo and Ploeen, 2014; Júnior, 2013; Lel, 2012, among others). In contrast, Chen and King (2014) obtain the significant but negative association between firm size and derivatives use, suggesting that smaller firms use more derivatives than larger firms. While, Charumathi and Kota (2012), Kumar and Rabinovitch (2013) show that firm size is not a determinant of derivatives usage.

In addition to firm size, Géczy *et al.* (1997) employ two proxies related to substitute to hedging with derivatives, namely foreign denominated debt and other types of derivatives to measure economies of scales. They hypothesize that benefits from hedging are greater for firms having more foreign denominated debt or using other types of derivatives, thus, these proxies are expected to be positive to hedging. They also use a variable associated to tax, that is pre tax foreign income, as a proxy of economies of scale and they find significantly positive relation between that variable and derivatives use.

(INSERT TABLE 3.5 HERE)

3.2.1.5. Substitutes to hedging with derivatives

The prior studies indicate that a firm's decision to use derivatives is also affected by other financial policies. Three substitutes to hedging with derivatives considered in extant literature are natural hedging, dividend policy and liquidity, and diversification.

With regards to natural hedging, convertible debt and foreign denominated debt are the most mainly used proxy in empirical studies. Nance *et al.* (1993) argue that firms with convertible debt have less incentive to hedge. Elliot, Huffman and Makar (2003) present strongly significant evidence that foreign denominated debt is negatively related to derivatives use, interpreting that it is used as a substitute for derivatives in reducing risks. On the contrary, recent studies show that they do not find evidence that firms prefer using foreign denominated debt than derivatives as hedging instruments (see Aabo and Ploeen, 20014; Júnior, 2013). Further, preference capital and long-term loans are included in some studies as proxy of natural hedging, but none of these studies obtain significant evidence supporting the notion that preference capital and long-term loans can replace derivatives in hedging risks (Clark and Judge, 2008; Guay and Kothari, 2003).

In terms of dividend policy, Berkman and Bradbury (1996) indicate that the likelihood of the firm using derivatives is lower when the firm's dividend payout is smaller. As such, dividend payout and dividend yield are used mainly in prior empirical studies, and expected to be positive to the use of derivatives. Nevertheless, empirical studies provide overall mixed evidence. Lel (2012), among others, strongly support the positive association between dividend yields and derivatives use, but Supanvanij and Strauss (2010) indicate that lower dividend yield increase the possibility of using derivatives by firms.

By the same token, it is predicted that liquidity is negatively related to the use of derivatives. Current ratio and quick ratio are employed as proxies of liquidity in extant empirical literature, of which quick ratio is preferred. In deed, in most of empirical studies, variable of quick ratio exhibits significant association with derivatives use in predicted sign. Therefore, it confirms that liquid assets are alternative hedging instruments rather than derivatives (e.g., Gay *et al.*, 2011; Afza and Alam, 2011, among others). On the contrary, some other studies such as Sprcic and

Sevic (2012), Clark and Judge (2008) do not find any evidence supporting the theoretical arguments. In terms of variable current ratio, Berkman and Bradbury (1996) confirm that liquidity acts as hedging substitute, whereas Gatopoulos and Louberge (2013) do not find any significant evidence.

Diversification is the third hedging substitute method considered in the literature. It is expected that the higher degree of diversification lead to lower propensity of using derivatives. Empirical studies employ several proxies to measure firms' extent of diversification, but they yield mixed results. Specifically, Júnior (2013), Chen and King (2014) obtain the significant association between industry and geographic diversification and derivatives use in predicted directions. By contrast, Aabo and Ploeen (2014) obtains significant evidence for variable foreign assets but it is not of hypothesized direction.

To sum up, the prior empirical studies provide inconclusive evidence of the substitute to hedging with derivatives. There is relatively strong evidence that probability of using derivatives is lower when firms have more liquid assets or lower dividend payout or smaller dividend yields. It supports the view that firms can use liquidity and dividend policy to manage risks rather than derivatives. In contrast, supporting evidence of natural hedging and diversification is very weak. Their finding raises question about the complexity of the relationship between diversification and the use of derivatives.

(INSERT TABLE 3.6 HERE)

3.2.1.6. Country-specific characteristics

The above sections show that existing empirical studies provide overall mixed evidence, and some studies find no evidence supporting hedging theory. Bartram *et al.* (2009) indicate that traditional tests of hedging theory have little power to explain the determinants of derivatives

usage. The inconclusive evidence may arise from the fact that a large body of extant literature investigates the firm-specific determinants of the use of derivatives, but a firm's decisions to use derivatives may not only depend on the firm's characteristics, but also are affected by the characteristics of the country where it operates. Therefore, a few researchers include country-specific characteristics in their analyses to investigate determinants of derivatives use.

There are very limited empirical studies investigating whether differences in economic, financial and legal environments across countries affect firms' decisions to use derivatives. Lievenbruck and Schmid (2014), Lel (2012) obtain significant association between GDP per capita and derivatives use in the predicted directions. The positive relationship between them implies that the higher the development of economies, the higher propensity of using derivatives by firms. In addition, Bartram *et al*. (2009) present that derivatives market rank is significantly important factor explaining why firms use derivatives. Their results imply that firms use more derivatives when they operate in countries with developed derivative markets.

Other factors provide mixed evidence at best. In particular, the effect of financial risk is always statistically significant but it is not at hypothesized prediction, whereas an effective legal environment has significant and positive effect on foreign currency derivatives, but it is unrelated to interest rate derivatives and commodity price derivatives (Bartram *et al.,* 2009). By the same fashion, closely held shares are statistically significant but just in the case of commodity price derivatives usage (Livenbruck and Schmid, 2014). Variables regulatory quality and long-term interest rates are insignificant, while the effect of inflation rate and long term exchange rate are very weak (Bartram *et al*., 2009).

3.2.2. Derivatives use and firm value

The relationship between derivative use and firm value remains an open question, as empirical evidence is overall inconclusive. In this section, we will review the papers that investigated the association between firm value and the use of derivatives by firms in countries outside East Asia over a few last decades from 2001 to the present. We partition existing empirical studies into 2 categories, unconditional analyses and conditional analyses.

(INSERT TABLE 3.7 HERE)

3.2.2.1. Unconditional analyses of relationship between derivatives use and firm value

A large body of the existing literature has investigated unconditional value effects of derivatives use, and they provide mixed evidence. *In the first stream,* many studies show that derivatives use is a value-increasing activity. Allayannis and Weston (2001) is the first to use Tobin's Q as proxy for firm value, and observe that Tobin's Q increases among the derivative users, indicating that the use of derivatives increases firm value. Following them, Belghitar, Clark and Mefteh (2013), Bartram, Brown and Conrad (2011), among others, also employ Tobin's Q to measure firm value. Although measures of Tobin's Q vary across papers, most of them find a significant and positive relationship between firm value and any type of derivatives use.

However, it is interesting to note that in spite of finding that derivatives use enhances firm value, the estimated magnitudes of the hedging premium vary across the studies. In terms of foreign currency derivatives, Allayannis and Weston (2001) find that the use of foreign currency derivatives increases the total firm value of U.S non-financial firms by average 4.8%. Taking U.S firms into account as well, Magee (2008) finds that the estimated long-run effect of foreign currency hedging on Tobin's Q is 1.939, suggesting that foreign currency hedging is associated

with an increase in firm value of 6.33%. In the case of non-financial firms in the UK, Clark and Judge (2009) indicate that foreign currency derivatives use increases firm value and hedging premium for all foreign currency hedgers is 12%, while hedging premiums for interest rate and commodity price derivative users ranges between 11% and 34%, respectively. These hedging premiums are considerably larger than premiums found in studies on U.S firms. On the contrary, Gómez-González, Rincón, and Rodríguez (2012) find that for Columbian corporations, an increase in foreign currency derivative use leads to a hedging premium of 1.8% on average.

Furthermore, Campello, Lin, Ma and Zou (2011) do not calculate hedging premium, but they present the evidence that average firm in their sample has an annual net gain from hedging of about 4.7% of its annual income. Meanwhile, Bartram, Brown and Conrad (2011) use a large sample of non financial firms from 47 countries in 2000-2001 and point out that the effect of derivative use on firm value is positive but more sensitive to endogeneity and omitted variable concerns.

In the second stream, there is some empirical evidence that the use of derivatives decreases firm value at some degrees. Khediri and Folus (2010) examine 320 non- financial listed firms in France and indicate that the derivative users have lower firm value than the non -users. Nguyen and Faff (2010) present that a hedging discount is most severely imposed on users of swaps, and it represents a 24% reduction in firm value in a sample consisting of 428 Australian firms. Consistent with the prior studies, Supanvanij (2011) shows weak evidence that economic value added can be negatively affected by the interest rate derivatives at 10% significance level.

In other strand, some previous studies do not provide any evidence of association between derivatives use and firm value, or provide mixed results. Representatively, Belghitar *et al.* (2013) conclude that there is no evidence of value creation of foreign currency derivative use, although

it is effective in reducing overall foreign currency exposure in case of French non financial firms. Likewise, Supanvaij (2011) finds no value effects for foreign currency derivative users, while the use of interest rate derivatives reduces firm value. Khediri and Folus (2010) also do not report significant results that are consistent with the argument that the use of derivatives increases the firm value. Especially, Magee (2008) finds that foreign currency hedging hinges on past amounts of firm value. Therefore, although foreign currency derivatives in long-term increases firm value by 6.33%, after controlling past effect of firm value the use of foreign currency derivatives does not affect firm value.

More interestingly, some researchers raise doubt about the relationship between derivatives use and firm value, and findings of other earlier studies. Guay and Kothari (2003) find that derivatives use generates modest amount relative to firm size, and operating and investing cash flows, and other benchmarks. So, they suggest that the substantial increases in firm value documented in the previous studies are either driven by other risk-management activities (e.g., operational hedges) that are correlated with derivatives use, or that the results are spurious.

3.2.2.2. Conditional analyses of relationship between derivatives use and firm value

Fauver and Naranjo (2010) points out that there might be agency costs of debt and monitoring problems related to derivatives use, thereby increasing probability of reduction in firm value at the expense of shareholders. Therefore, on contrary to empirical studies testing a direct relation between the use of derivatives and firm value as mentioned in the previous part, a few studies, namely Fauver and Naranjo (2010), Allayannis, Lel, and Miller (2012), Marami and Dubois (2013), Chen and King (2014), investigate the conditional effects of derivatives use on firm value.

To our best knowledge, Fauver and Naranjo (2010) is the first to examine the relationship between derivatives usage and value effects associated with agency and monitoring problems. Following the prior researchers, they use Tobin's Q as proxy for firm value in an analysis of 1746 non-financial firms located in U.S from 1991 to 2000. They find that firms with greater agency and monitoring problems exhibit a negative association between Tobin's Q and derivative usage. The negative effect is significant with an impact of -8.4% on Tobin's Q from a one standard deviation change in the firm monitoring index.

By the same token, Allayannis *et al*. (2012) takes into account corporate governance problems at both internal firm-level and external country-level. Their study shows that the use of currency derivatives for firms with strong firm- level and country- level governance is associated with a significant value premium of 10.7%, whereas there is no hedging premium for firms with weak corporate governance.

In addition, Chen and King (2014) investigates value effect of derivatives use interacted with cost of debt among 1832 U.S non-financial firms during the period of 1994-2009, and evidences that hedging is positively related to Tobin's Q, supporting the view that that the use of derivatives creates value. They also indicate that derivatives use creates value by mitigating negative effect of increasing borrowing costs on capital expenditure, which is evidenced by positive estimated coefficient on interaction term between hedging and yield spread.

On the other hand, some other studies find mixed evidence on value effect of derivatives use. Analyzing the link between mandatory and voluntary interest rate derivatives use and firm value, Marami and Dubois (2013) find that mandatory use increases firm value with average premium of 7.6%. But there is no significant impact from voluntary ones. Additionally,

Pramborg (2004) finds that there is a positive value effect from hedging transaction exposure for firms that are geographically diversified, while hedging translation exposure does not add value.

3.2.3. Effects of derivatives usage on exposure

A firm's value is determined by two variables: expected net cash flow and discount rate (cost of capital). A reduction in cost of capital as a consequence of reduced exposure leads to an increase in firm value; and value relevance of derivatives use should be gauged quantitatively by the reduced exposure as a contributing factor to enhanced firm value in the value chain (Zhou and Wang, 2013). While determinants of derivatives use have been relatively thoroughly investigated, the impact of financial derivatives use on firms' exposure has only recently become a subject for empirical analysis and the research remains occasional. Moreover, most of previous studies focus on foreign currency exposure, but interest rate exposure and commodity price risk are not examined in-depth. And the empirical evidence is mixed at best.

(INSERT TABLE 3.8 HERE)

In the first strand, several studies assess the effect of derivatives use on exposure and report significant reduction in exposure. These studies report exposure effects ranging from as low as 2.387% to as high as 54%. Following Jorison (1990), Allyannis and Ofek (2001) use a market model, and show that there is a negative relationship between a firm's exchange rate exposure and its hedging intensity.

Consistent with Allyannis and Ofek (2001), Nguyen and Faff (2003) apply the same methodology, and their results support the view that foreign currency derivatives reduce exchange rate exposure in the long run. Additionally, Zhou and Wang (2013) evidences that UK non-financial firms use derivatives to hedge against unfavorable exchange rate movements and hedging is effective in reducing firms' risk exposure to varied degrees.

On the other hand, Adam and Fernando (2006) applies Fama-French model to examine the case of 92 gold mining firms in North America from 1989-1999. They conclude that hedging is immensely profitable as derivative users alleviate their one-year exposure to gold prices by 54% on average, and earn substantial additional cash flows from their derivative transactions.

Huffman, Makar and Beyer (2010) investigate a sample of 185 US MNCs with exposure to exchange rate risk by applying Fama-French model and market model. When the dependent variable is the highest foreign exchange exposure, both models find that hedging is negatively related to the exposures, suggesting that derivatives usage leads to lower probability of foreign exchange exposures being faced by firms.

Notably, employing market model, Clark and Mefteh (2011), Belghitar *et al.* (2013) emphasize that foreign currency derivatives use by French non-financial firms has a significant negative effect on foreign currency exposure only when asymmetry is considered. Further, attempting to provide evidence of relationship between hedging and exposure in the international context, Bartram, Brown and Minton (2010) examine 1150 firms from 6 countries in 2003 by applying the market model. They find that foreign currency derivatives reduces exposure to exchange rate risk by about 11.5%, while financial hedging (foreign currency debt and derivatives) accounts for approximately 40% reduction in exposure. On the contrary, Hutson and Laing (2014) figure out that both derivatives use and operational hedging significantly alleviate exposure, supporting the notion that operational hedging and the use of derivatives are complementary, rather than substitutes.

In the second strand, the arguments that derivatives usage efficiently reduces firm's exposures are questioned by some empirical studies. On contrary to findings of Allayannis and Ofek (2001), Choi and Jiang (2009) find that financial hedging has no impact on exposures for

both MNC and non-MNC in both the market and Fama-French models. We argue that reasons may arise from the difference in explanatory variables. In deed, the former uses notional value of derivatives use in a single year of 1993, whereas the latter uses financial hedging dummy with a size and industry-matched MNC and non-MNC sample during the period of 2000-2006.

Recently, Treanor *et al.* (2014) present evidence that hedging premium does not increase in U.S airlines facing exposure to fuel prices, implying that hedging may not reduce fuel price risk in US airline industry. Consistently, Berghofer and Lucey (2014) also reject the hypothesis that financial hedging decreases exposure to fuel prices.

In other stream, Nguyen and Faff (2010) provide mixed results. They report that for derivative users with hedging intensity of less than 40%, the use of interest rate derivatives reduces risk by approximately 2.387%. In the case of extensive derivative users, on the other hand, derivative use seems to increase firm risk. However, when they compare derivative users and non-users, they find no evidence suggesting that those firms are more exposed to risks than non-users.

By the same token, Yip and Nguyen (2012) scrutinizes the effect of derivatives use on exposure when the global financial crisis happened. They evidence that exchange rate exposure is time varying, and derivatives usage is related to a lower levels of exposure when exposure is solely regressed against it. However, there is not adequate evidence to show that an increased derivatives use leads to lower exposures during the global financial crisis.

The reasons why derivatives use is not related to a reduction in exposures can come from the fact that firms implement other hedging methods such as operational hedging, or natural hedging. *Second*, it may be due to selective hedging from firms. *Third*, the amount of derivatives use is small relative to firm size, and operating and investing cash flows, and other benchmarks

especially when foreign exchange rates, interest rates and commodity prices change at the same time as Guay and Kothari (2003) point out. *Four*, problems may lie beneath the augmented market model, on which many studies primarily rely. In particular, a hinted assumption of augmented market model is that exposure is constant over time, but Yip and Nguyen (2012) figures out that foreign exchange exposure is time varying.

3.3. Empirical studies in East Asia

There is a fact that due to the lack of availability of data on hedging positions, studies on derivatives use of East Asian firms are relatively rare and limited in scope. In this section, we will review empirical studies on determinants of derivatives use, on the value effects of derivatives usage, and on the association between the use of derivatives and exposures in the context of East Asia from 1998 to the present.

(INSERT TABLE 3.9 HERE)

3.3.1. Determinants of derivatives use

To the best of our knowledge, only Allyannis, Brown and Klapper (2003) analyze exchange rate derivatives use of 372 non-financial firms across 8 East Asia countries in the period of 1996-1998. They evidence that, in contrast to studies on US firms, there is limited support for hypotheses of costs of bankruptcy and financial distress, and agency cost of debt. Likewise, they do not find positive relationship between firm size and the use of derivatives, except the case of Hong Kong firms.

More interestingly, they indicate that derivative use does not increase firm value and there is no evidence that East Asian firms eliminate their foreign exchange exposure by using derivatives, because the use of foreign exchange derivatives was selective, too narrow in scope, and interrupted when the Asian financial crisis began. Additionally, in comparison with firms not

using derivatives, they find that in pre-crisis period, derivative users perform as poorly as those firms. In the after-crisis period, derivative users perform better than non-users to some degree; however, this result is due to derivative market illiquidity during that period.

Other studies examine derivatives use within one country and the focus of most studies is the understanding of determinants of currency derivatives usage. Hu and Wang (2006) fails to support hedging theory in the case of 419 non-financial firms in Hong Kong, but they find evidence supporting the notion that derivatives use reduces exposure that firms face. Notably, their results show that firm-specific characteristics do not affect firms' decisions to hedge, but other specific factors of Hong Kong such as currency policy, knowledge of foreign currency hedging are determinants of derivative activities.

On the contrary, Tungsong (2010) investigates the case of Thailand, and they exhibit strong evidence that firms use derivatives to alleviate costs of financial distress, and agency costs of debt. Likewise, Lantara (2012) examines firms in Indonesia and indicates that the larger the firm, the higher the growth opportunities of the firms, the greater exposures that firms face lead to higher extent of derivatives use. Additionally, negative association between liquidity and derivatives use suggest that liquid assets can act as hedging substitute.

All other studies analyze the case of non-financial firms in Malaysia (e.g., Fazilah, Azizan, and Hui, 2008; Ahmad and Haris, 2012; Shaari *et al*., 2013; Chong, Chang, and Tan, 2014). The common feature of these studies is that almost all variables being examined are statistically significant but at opposite hypothesized prediction. *Firstly*, on contrary to arguments of substitutes to hedging with derivatives, Fazilah *et al*. (2008) figure out that the smaller the dividend yield, the higher the probability of using derivatives by firms, whereas Shaari *et al*. (2013) exhibit statistically positive relationship between liquidity and the use of derivatives.

Secondly, it is extremely astonishing that in the analysis of hypothesis of financial distress and bankruptcy costs, Shaari *et al*. (2013) show that firms with lower leverage or lower profitability use more derivatives to hedge those costs. Recently, Chong *et al*. (2014) surveys 219 non-financial firms in Malaysia, but they concentrate on hedging practices rather than testing hedging theory.

3.3.2. Derivatives use and firm value

As shown in table 3.9, there are very limited empirical studies on the association between derivative use and firm value in the context of East Asia. Actually, no study directly investigates that relationship across countries in East Asia, but a few examine the value effects of derivatives usage across industries of one country. Remarkably, two out of these three studies take into account both financial firms and non-financial firms, and provide ambiguous evidence at best. Ameer (2009) uses firm share price as proxy for firm value to examine a sample of 40 listed non -financial firms and banks for the period of 2003-2007 in Malaysia. He finds that although disclosed notional amount of the derivatives have value relevance but its contribution to a firm's valuation is very minimal.

On the other hand, Oktavia (2012) examines 160 financial and non-financial firms in Indonesia. In his study, price to book value ratio acts as proxy of market value, and his findings show that non-financial firms use derivatives for speculation, while banks use derivatives for hedging. More importantly, he evidences that derivatives use by non-financial firms can enhance shareholder value, but it does not affect earnings of banks.

Among studies scrutinizing the value effects of derivatives usage, only Yin and Qui-qi (2010) use Tobin's Q with a sample of 295 non-financial Chinese firms. Consistent with most of studies outside East Asia, they find that derivatives use rewards firms with higher value.

3.3.3. Effects of derivatives use on exposures

Empirical studies on value effect of derivatives use are very limited, but empirical studies on association between the use of derivatives and exposures are more rare. To the best of our knowledge, there is only study by Ameer, Matisa and Abdullah (2011) directly investigates that association. However, they show that the use of derivatives is not statistically significant to firms' cost of capital, indicating that derivatives use does not affect the extent of exposures to which firms face.

In spite of not examining the relationship between derivatives use and exposures directly, He and Ng (1998) is the first paper and up to date is the most thorough analysis of exposures that Japanese multinational firms face. They find that 25% of firms in the sample experience economically significant positive exposure effects, and highly leveraged firms, or firms with low liquidity tend to have smaller exposures. More importantly, they evidence that consistent with hedging theory, the extent to which a firm is exposed to exchange rate volatility can be explained by variables that are proxied for a firm's hedging motivations. These findings suggest that Japanese MNCs with high leverage or low liquidity use more derivatives to hedge, and eventually reduce exchange rate exposure.

Finally, it is interesting to note that one caveat to the above generalization of prior empirical studies is that they only investigate exchange rate exposure, but ignore other types of exposures.

3.4. Conclusion

This chapter evaluated the extant empirical studies on testing hedging theory, on value effects of derivatives use, and on relationship between derivatives use and exposures in the context of both outside and inside East Asia by carefully assembling, classifying and analyzing evidence through dependent variables, widely used explanatory variables and methodologies.

The *first* finding reveals that the vast body of extant literature focuses on developed countries outside of East Asia, while studies on this region are very limited.

Secondly, the comprehensive review of prior studies on determinants of derivatives usage shows that prior studies provide overall mixed results. For example, most of variables used to test hypothesis of financial distress and bankruptcy costs provide ambiguous evidence, although a small number of variables, such as credit rating, are statistically significant and in the hypothesized directions. Additionally, several variables such as leverage, dividend, liquidity, and size are used as proxies in tests of more than one hypothesis. Thus, it leads to complexity in interpreting results and makes analyses less powerful. Besides variables investigating traditional hedging theory, in recent years, new explanations for firms' incentives to use derivatives, which are based on country-specific characteristics, are considered in the literature. To measure difference in economic, financial and political environment across countries, these studies employ different variables, however, they also do not provide clear-cut evidence. Therefore, the review argues that it is necessary to improve hedging theory, as well as the variables to measure determinants of derivatives use.

Thirdly, this chapter thoroughly surveys empirical studies on relationship between the use of derivatives and firm value and finds out that the extant literature can be broken down into unconditional analyses and conditional analyses. In spite of different measures across studies, Tobin's Q is the most popularly used proxy of firm value in both unconditional and conditional studies. In the group of unconditional tests on value effects of derivatives usage, many studies find positive relationship, but hedging premium ranges from 4.87% to 34%. Other papers show no relation or mixed results. Recently, a few researchers propose investigation for the conditional effects of derivatives use on firm value. Nevertheless, they provide relatively different results

with different effects. The impact of derivatives usage on firm value is, therefore, an open empirical issue.

Fourthly, the review of studies on association between derivatives use and exposures show that most of studies find negative relationship between them, suggesting that the use of derivatives reduces the extent of exposures to which firms face, while other papers find contracting evidence or no relation. We strongly find that the mixed results of prior studies may come from different models they use; even they use the same model but derivative dummy is explored rather than derivative notional value also leads to different results. More importantly, we find that different effects of derivatives use may derive from the fact that firms use other hedging methods besides derivatives, or firms selectively hedge; or the amount of derivatives is small or exposures are time-varying.

Table 3.1: Empirical studies examining hedging theory (in chronological order)

No	Authors	Year	Area of study	Country & Sample size	Methodology	Dependent variables	Financial distress costs	Taxes	Agency cost of debt	Economies of scales	Substitutes to derivatives	Country-specific characteristics
1	Nance, Smith, Smithson	1993	All	Fortune 500 – 169	Logit	Binary	✓	✓	✓		✓	
2	Berkman and Bradbury	1996	All	New Zealand-116	Tobit	Continuous	✓	✓	✓		✓	
3	Mian	1996	FC & IR	Compstat &Narrs-3022	Logit	Binary	✓	✓	✓		✓	
4	Tufano	1996	CP	North America -48	Tobit	Continuous	✓	✓	✓		✓	
5	Géczy, Minton, Schrand	1997	FC	US -372	Logit	Binary	✓	✓	✓	✓	✓	
6	Allayannis and Ofek	2001	FC	S&P500- 378	Cragg model	Binary/Continuous	✓	✓	✓	✓		
7	Nguyen and Faff	2002	All	Australia- 239	Logit/Tobit	Binary/Continuous	✓		✓		✓	
8	Abimbola and Adedeji	2002	IR	UK	Survey/Logit	Binary	✓		✓	✓	✓	
9	Elliott, Huffman, Makar	2003	FC	US – 88	3SLS	Continuous				✓	✓	
10	Hagelin	2003	FC	Sweden -160	Logit /Cragg	Binary	✓		✓	✓		
11	Guay and Kothari	2003	All	Compstat – 413	Probit	Continuous	✓		✓	✓	✓	
12	Judge	2006	FC	UK- 366	Logit	Binary	✓	✓	✓	✓	✓	
13	Judge	2006	All	UK- 441	Logit	Binary	✓		✓	✓	✓	
14	Spano	2007	FC	UK- 443	Tobit/Probit	Binary/Continuous	✓	✓	✓	✓	✓	
15	Clark and Judge	2008	FC	UK-366	Logit	Binary	✓		✓	✓	✓	
16	Bartram, Brown, Fehle	2009	All	50 countries- 7319	Probit	Binary	✓		✓			✓
17	Supanvanij and Strauss	2010	FC & IR	S&P500-198	Two stage IV approach	Continuous	✓	✓	✓	✓	✓	
18	Fauver and Naranjo	2010	All	US- 1746	Logit	Binary			✓			
19	Afza and Alam	2011	FC	Pakistan-86	Logit	Binary	✓	✓	✓	✓	✓	
20	Gay, Lin, Smith	2011	All	US-1541	Probit/Tobit	Binary/Continuous	✓	✓	✓	✓	✓	
21	González, Sara, Onofre	2011	FC&IR	Spain-28	Logit /Tobit	Binary/Continuous	✓			✓		
22	Charumathi and Kota	2012	All	India-121	OLS	Continuous	✓		✓	✓	✓	
23	Lel	2012	FC	30 countries – 253	Logit /Tobit	Binary/ Continuous	✓	✓	✓	✓	✓	✓
24	Sprcic and Sevic	2012	All	Croatia-157 Slovenia-189	Logit/ OLS	Binary	✓	✓	✓	✓	✓	
25	Gatopoulos, Louberge	2013	FC	5 Latin American countries -103	Logit/ Tobit/ Cragg model	Binary/Continuous	✓		✓	✓	✓	✓
26	Kumar and Rabinovitch	2013	CP	Hoovers-41	Tobit	Continuous	✓	✓	✓	✓		
27	Júnior	2013	FC	Brazil- 200	Logit	Binary	✓		✓	✓	✓	
28	Aabo and Ploeen	2014	FC	Germany-198	OLS/ Probit	Binary/Continuous	✓		✓	✓	✓	
29	Lievenbruck, Schmid	2014	All	50 countries – 500	Probit/ tobit	Binary/Continuous	✓		✓	✓		✓
30	Chen and King	2014	All	US-1832	Cross-sectional regression	Continuous	✓		✓	✓	✓	

Note: *"All"* means foreign currency, interest rate and commodity price derivatives; *FC* means foreign currency derivatives; *IR* means interest rate derivatives; *CP* means commodity price derivatives

Table 3.2: Empirical evidence on the hypothesis of bankruptcy costs and financial distress costs

Variables	**Leverage**	**Cash costs**	**Conv. Debt**	**Credit rating**	**Divid.**	**Int.Cov. Ratio**	**Gross margin**	**Debt ratio**	**Pref. Cap.**	**Human Cap.**	**ROA**	**R. On Cap.**	**Liq.**	**Size**	**Tang. Assets**	**Tax Loss**	**Net interest**
Theory prediction	+	+	?	-	?	-	-	+	?	-	-	-	-	?	-	+	-
Géczy, Minton, Schrand (1997)								no					yes				
Allayannis and Ofek (2001)	*no* *0.05*										no						
Hagelin (2003)	*no* *0.1*				neg.					*no* *0.1*			yes				
Guay and Kothari (2003)	yes																
Judge (2006)	**yes** **0.01**			**yes** **0.01**		**yes** **0.01**								**pos.** **0.01**		**yes** **0.1**	**yes** **0.01**
Spano (2007)								no									
Clark and Judge (2008)				**yes** **0.05**										pos.		yes	
Bartram, Brown, Fehle (2009)	**yes** **0.01**					**yes** **0.1**							**yes** **0.01**	**pos.** **0.01**			
Supanvanij and Strauss (2010)								**yes** **0.01**									
Afza and Alam (2011)	*no* *0.05*					**yes** **0.05**					**yes** **0.1**				**yes** **0.01**		
Gay, Lin, Smith (2011)	no													**pos.** **0.01**			
González, Sara, Onofre (2011)	**yes** **0.05**													**pos.** **0.01**			
Charumathi and Kota (2012)						yes		yes									
Lel (2012)	yes																
Sprcic and Sevic (2012)				*no* *0.05*[c]													
Gatopoulos and Louberge (2013)	**yes** **0.1**						yes										
Kumar and Rabinovitch (2013)								**yes** **0.01**					yes				
Júnior (2013)								no						**pos.** **0.1**			
Aabo and Ploeen (2014)							yes				yes		*no* *0.1*	**pos.** **0.01**			
Lievenbruck, Schmid (2014)	**yes** **0.01**[a]										*no* *0.1*						
Chen and King (2014)	**yes** **0.01**			**yes** **0.01**		**yes** **0.01**					**yes** **0.01**						

Note: A "yes" in the table denotes that the evidence is in the line with theory prediction; a "no" denotes that evidence is opposite to the theoretical prediction. The "pos." and "neg." stand for positive and negative direction, respectively. Numbers below "yes", "no", "pos.", "neg." are *p-value*. Bold text indicates that the evidence is both statistically significant and in the line with theory prediction. Italic text indicates that the evidence is statistically significant but opposite to the theoretical sign. **(**a) Evidence is obtained from testing interest rate derivatives use only**, (**b) Evidence is from Logit test**, (**c) Evidence is related to Croatia case only

Table 3.3: Empirical evidence on the tax hypothesis

Proxies	**Progressivity Dummy**	**Marginal tax rates**	**Investment Tax credits**	**Foreign tax credits dummy**	**Tax-loss carry forwards (TLCF)**	**TLCF dummy**	**Tax charges**	**TLCF and tax loss carry backs**
Theory prediction	**+**	**+**	**+**	**+**	**+**	**+**	**-**	**+**
Nance, Smith, Smithson (1993)	yes		**yes**		yes			
			0.1					
Berkman and Bradbury (1996)				**yes**				
				0.05				
Mian (1996)	yes			**yes**	yes			
				0.01[a]				
Tufano (1996)					yes			
Géczy, Minton, Schrand (1997)					yes			
Allayannis and Ofek (2001)						yes		
Judge (2006)					**yes**			
					0.05			
Spano (2007)							**yes**	
							0.05	
Supanvanij and Strauss (2010)						**yes**		
						0.01		
Afza and Alam (2011)						*no*		
						0.1		
Gay, Lin, Smith (2011)					no			
Sprcic and Sevic (2012)								yes
Kumar and Rabinovitch (2013)		**yes**						
		0.05						

Note:
A "yes" in the table denotes that the evidence is in the line with theory prediction; a "no" denotes that evidence is opposite to the theoretical prediction. The "pos." and "neg." stand for positive and negative direction, respectively. Numbers below "yes", "no", "pos.", "neg." are *p-value*. Bold text indicates that the evidence is both statistically significant and in the line with theory prediction. Italic text indicates that the evidence is statistically significant but opposite to the theoretical sign.
a. Evidence is obtained from testing foreign currency derivatives use only

Table 3.4: Empirical evidence on the agency cost of debt hypothesis

Variables	**Acqui. Activity**	**Asset Growth/ C.Flow**	**B/M ratio**	**E/P ratio**	**Explo. Activity**	**Free C. Flow**	**Leverage**	**Invest. Expenses**	**Earnings volatility**	**R&D**	**Capital Expense**	**Div.**	**Liq.**	**Size**	**Gearing**	**Tobin 's Q**	**Profit Marg**
Theory prediction	+	+	-	-	+	+	+	+	+	+	+	?	-	?	+	+	-
Nance, Smith, Smithson (1993)			yes				no										
Berkman and Bradbury (1996)		no		**yes[a] 0.1**													
Mian (1996)			*no 0.01[b]*														
Tufano (1996)	yes				no												
Géczy, Minton, Schrand (1997)			yes							**yes 0.05**							
Allayannis and Ofek (2001)			yes							**yes 0.05**		neg.					
Abimbola and Adedeji (2002)				**yes 0.1**													
Judge (2006)														**pos. 0.01**	**yes 0.01**		
Spano (2007)										**yes 0.01**						no	
Clark and Judge (2008)														pos			
Bartram, Brown, Fehle (2009)			**yes 0.01**														**no 0.01**
Fauver and Naranjo (2010)						**yes 0.05**											
Supanvanij and Strauss (2010)			**yes 0.01**														
Afza and Alam (2011)			yes														
Gay, Lin, Smith (2011)			yes														
Lel (2012)						*no 0.05*											
Gatopoulos, Louberge (2013)											**yes 0.01**					**yes 0.05**	
Júnior (2013)			*no 0.1*										yes				
Aabo and Ploeen (2014)			no							**yes 0.1**							
Lievenbruck, Schmid (2014)			no														
Chen and King (2014)			no				**yes 0.01**		**yes 0.01**								

Note: A "yes" in the table denotes that the evidence is in the line with theory prediction; a "no" denotes that evidence is opposite to the theoretical prediction. The "pos." and "neg." stand for positive and negative direction, respectively. Numbers below "yes", "no", "pos.", "neg." are *p-value*. Bold text indicates that the evidence is both statistically significant and in the line with theory prediction. Italic text indicates that the evidence is statistically significant but opposite to the theoretical sign.

a. Evidence is obtained when dependent variable is fair value of derivatives

b. Evidence is obtained from testing interest rate derivatives use only

Table 3.5: Empirical evidence on the hypothesis of economies of scales

Variables	Firm size	Pre tax Foreign income	Revenue	Book value of total sales	Market value	Firm value	Foreign denominated debt	Other types of derivatives
Theory prediction	**?**	**+**	**?**	**?**	**+**	**?**	**+**	**+**
Mian (1996)	**pos.**							
	0.01							
Géczy, Minton, Schrand (1997)	**pos.**	**yes**					**yes**	**yes**
	0.01	**0.1**					**0.05**	**0.05**
Allayannis and Ofek (2001)	**pos.**							
	0.01							
Abimbola and Adedeji (2002)						**pos.**		yes
						0.01		
Elliot, Huffman, Makar (2003)					**yes**			
					0.01			
Guay and Kothari (2003)	**neg.**							
	0.05							
Judge (2006)	**pos.**							
	0.01							
Clark and Judge (2008)	pos.							
Supanvanij and Strauss (2010)				**neg.**				
				0.01				
Afza and Alam (2011)	pos.							
Gay, Lin, Smith (2011)	**pos.**							
	0.01							
González, Sara, Onofre (2011)	**pos.**							
	0.01							
Charumathi and Kota (2012)	**pos.**		pos.					
	0.01							
Lel (2012)	**pos.**							
	0.01							
Sprcic and Sevic (2012)				pos.				
Gatopoulos and Louberge (2013)	pos.							
Kumar and Rabinovitch (2013)	neg.							
Júnior (2013)	**pos.**							
	0.1							
Aabo and Ploeen (2014)	**pos.**							
	0.01							
Lievenbruck and Schmid (2014)	**pos.**							
	0.01							
Chen and King (2014)	**neg.**							
	0.01							

Note:
A "yes" in the table denotes that the evidence is in the line with theory prediction; a "no" denotes that evidence is opposite to the theoretical prediction. The "pos." and "neg." stand for positive and negative direction, respectively. Numbers below "yes", "no", "pos.", "neg." are *p-value*. Bold text indicates that the evidence is both statistically significant and in the line with theory prediction. Italic text indicates that the evidence is statistically significant but opposite to the theoretical sign.

Table 3.6: Empirical evidence on substitutes to hedging with derivatives

Variables	Diver.	Current ratio	Quick ratio	Pref. stock	FD Debt	Geograph. Diver.	Quasi equity	Div. Payout	Div. yield	Preference capital	Long term loans	Industry Diver.	Convertible debt	Foreign assets
Theory prediction	-	-	-	-	-	-	-	+	+	-	+	-	-	-
Nance, Smith, Smithson (1993)		yes		yes					**yes**				no	
									0.01					
Berkman and Bradbury (1996)		**yes**					no	yes						yes
		0.05[a]												
Mian (1996)														
Tufano (1996)	no		**yes**											
			0.05											
Géczy, Minton, Schrand (1997)					yes									
Nguyen and Faff (2002)									**yes**					
									0.01[b]					
Abimbola and Adedeji (2002)			no					yes		yes				
Elliot, Huffman, Makar (2003)					**yes**	yes								
					0.01									
Guay and Kothari (2003)						no						no		
Judge (2006)			**yes**											
			0.01											
Spano (2007)			**yes**						**yes**		no			
			0.05						**0.1**					
Clark and Judge (2008)			yes											
Supanvanij and Strauss (2010)			**yes**						*no*					
			0.01						*0.05*					
Afza and Alam (2011)			**yes**					no						
			0.01											
Gay, Lin, Smith (2011)			**yes**									*no*		
			0.01									*0.05*[c]		
Charumathi and Kota (2012)	yes													
Lel (2012)									**yes**				yes	
									0.05					
Sprcic and Sevic (2012)			no											
Gatopoulos and Louberge (2013)		no												
Júnior (2013)					*no*	*no*						no		
					0.1	*0.05*								
Aabo and Ploeen (2014)					yes							yes		*no*
														0.01
Chen and King (2014)												**yes**		
												0.01		

Note:
A "yes" in the table denotes that the evidence is in the line with theory prediction; a "no" denotes that evidence is opposite to the theoretical prediction. The "pos." and "neg." stand for positive and negative direction, respectively. Numbers below "yes", "no", "pos.", "neg." are *p-value*. Bold text indicates that the evidence is both statistically significant and in the line with theory prediction. Italic text indicates that the evidence is statistically significant but opposite to the theoretical sign. Upper *a refers to* results obtained when dependent variable is fair value of derivatives. Upper *b* refers to evidence from Tobit test. Upper *c* refers to evidence from Probit test.

Table 3.7: Empirical studies on the relationship between derivatives use and firm value (in chronological order)

No	Authors	Year	Area of study	Country & Sample size	Methodology	Dependent variables	Main explanatory variables	Effect of derivatives use on firm value		
								Increase	Decrease	No effect
Panel A: Unconditional analyses										
1	Allayannis and Weston	2001	FC	US – 720	Tobin's Q	Tobin's Q	Derivative dummy/ notional value	4.87%		
2	Guay and Kothari	2003	All	Compustat-413	OLS	Cash flow/ market value sensitivity	Derivative notional value	?		
3	Pramborg	2004	FC	Sweden-359	Questionaire/ Tobin's Q	Tobin's Q	Derivatives dummy			
4	Carter, Rogers, Simkins	2006	CP	US-28	Tobin's Q	Tobin's Q	Derivatives dummy	5% - 10%		
5	Magee	2008	FC	US- 408	Tobin's Q	Tobin's Q	Derivative notional value	6.33%		[g]
6	Clark and Judge	2009	FC	UK-412	Tobin's Q	Tobin's Q	Derivatives dummy	11% – 34%		
7	Lin, Pantzalis, Park	2009	FC&IR	US- 90	Cross sectional regression	Cumulative abnormal return	Derivative dummy/ notional value			
8	Khediri and Folus	2010	All	France- 320	Tobin's Q	Tobin's Q	Derivatives dummy		[a]	[b]
9	Nguyen and Faff	2010	All	Australia – 428	Tobin's Q	Tobin's Q	Derivative dummy/ notional value		24%[c]	
10	Bartram,Brown, Conrad	2011	All	47 countries - 6,888	Tobin's Q	Tobin's Q	Derivatives dummy			
11	Supanvaij	2011	FC&IR	S&P500 – 231	Fixed effect panel data	ROA, ROE, EVA	Derivative notional value		[d]	
12	González, Sara, Onofre	2011	FC&IR	Spain-28	Cross-sectional regression	ROA, ROE, EVA	Derivative dummy/ notional value			
13	Campello, Lin, Ma, Zou	2011	FC&IR	US-1185	OLS/IV estimation	Return on investment	Derivative dummy/ notional value			
14	Eduado, Carlos, Juliet	2012	FC	Colombia-81	Tobin's Q	Tobin's Q	Derivative notional value	1.8%		
15	Yang	2013	FC	US-20	OLS	ROA, average abnormal return	Derivative notional value			
16	Belghitar, Clark, Mefteh	2013	FC	France-211	3SLS	Tobin's Q	Derivative notional value			
Panel B: Conditional analyses										
17	Fauver and Naranjo	2010	All	US- 1746	Tobin's Q	Tobin's Q	Derivative dummy		-8.4%	
18	Allayanmis, Lel, Miller	2012	FC	39 countries -372	Tobin's Q	Tobin's Q	Derivative dummy	10.7%		
19	Marami and Dubois	2013	IR	US- 728	Tobin's Q	Tobin's Q	Derivative notional value	7.6%[e]		[f]
20	Chen and King	2014	All	US-1832	Pooled OLS	Tobin's Q	Derivative dummy			

Note: "All" means foreign currency derivatives, interest rate derivatives and commodity price derivatives. "FC", "IR", and "CP" mean foreign currency derivatives, interest rate derivatives, and commodity price derivatives, respectively. EVA stands for economic value added. Upper word *a* denotes results obtained from univariate analysis; Upper word *b* denotes results obtained from multivariate analysis; Upper word *c* denotes results for hedging by swaps only; Upper word *d* denotes results for interest rate derivatives only; Upper word *e* denotes results for mandatory interest rate hedging; Upper word *f* denotes results for voluntary interest rate hedging; Upper word *g* denotes results obtained after controlling past amounts of firm value.

Table 3.8: Empirical studies on the relationship between derivatives use and exposures (in chronological order)

No	Authors	Year	Area of study	Country & Sample size	Methodology*	Dependent variables	Main explanatory variables	Effect of derivatives use on exposures		
								Increase	Decrease	No effect
1	Allayannis and Ofek	2001	FC	S&P500- 378	Market model	FC exposure	Derivative notional value		✓	
2	Nguyen and Faff	2003	FC	Australia- 144	Market model	FC exposure	Derivative notional value		✓	
3	Adam and Fernando	2006	All	North America -92	FF model	Firm's stock market beta	Hedge ratio		54%	
4	Choi and Jiang	2009	FC	US-889	Market model/ FF model	FC exposure	Derivative dummy			✓
5	Huffman, Makar, Beyer	2010	FC	US-185	Market model/ FF model	FC exposure dummy	Derivative dummy		✓	
6	Nguyen and Faff	2010	FC&IR	Australia -469	Market model	Total risk/ Systematic risk/ Unsystematic risk	Derivative notional value	✓[b]	2.387%[a]	
7	Bartram, Brown, Minton	2010	FC	16 countries -1150	Market model	FC exposure/ IR exposure	Derivative dummy		11.5%	
8	Clark and Mefteh	2011	FC	France- 176	Market model	FC exposure	Derivative dummy		✓	
9	Gay, Lin, Smith	2011	All	US-1541	FF model	Cost of equity	Derivative dummy		24-78 bpt	
10	Aysun and Guldi	2012	FC	6 countries-3227	Market model	FC exposure	Firms' derivative market participation		✓	
11	Yip and Nguyen	2012	FC	Australia – 97	Market model	FC exposure	Derivative dummy/ Derivative notional value		✓[c]	✓[d]
12	Yun and Wang	2013	FC	UK-249	Market model	FC exposure	Derivative fair value		✓	
13	Chang, Hsin, Hou	2013	FC	Compustat-2790	FF model	FC exposure	Derivative dummy		✓	
14	Belghitar, Clark, Mefteh	2013	FC	France-211	Market model	FC exposure	Interactive variable of derivatives		✓	
15	Treanor, Rogers, Carter, Simkins	2014	CP	US-29	Market model	Fuel hedging percentage	Exposure to fuel prices			✓
16	Hutson, Laing	2014	FC	US-953	Market model	FC exposure	Derivative dummy		✓	
17	Berghofer and Lucey	2014	CP	Asia, Europe, North America-64	Market model	CP exposure	Fuel requirements hedged/ hedging maturity			✓

Note: "All" means foreign currency derivatives, interest rate derivatives and commodity price derivatives. "FC", "IR", and "CP" mean foreign currency derivatives, interest rate derivatives, and commodity price derivatives, respectively. Methodologies mentioned on the table are methodologies used for estimating exposures. FF model stands for Fama-French model.
a- results for interest rate derivative users;
b- results for extensive derivative users;
c- results are obtained when exposures are solely regressed against derivatives usage;
d- results for the global financial crisis.

Table 3.9: Summary of previous studies on derivatives use in East Asia countries (in chronological order)

Panel A: Studies on determinants of derivatives use

No	Authors	Year	Area of study	Country & Sample size	Methodology	Dependent variables	Financial distress costs	Taxes	Agency cost of debt	Managerial risk aversion, compensation	Info. Asymmetry	Econ. of scales	Substitutes	Corporate governance	Country -specific
1	Allaynnis, Brown, Klapper	2001	FC	8 countries – 372	Logit/ Tobit	Continuous	✓		✓			✓	✓		✓
2	Allaynnis, Brown, Klapper	2003	FC	8 countries – 372	Tobit	Continuous	✓		✓			✓	✓		✓
3	Hu and Wang	2006	FC	HK-419	Logit	Binary	✓	✓	✓			✓			
4	Fazilah, Azian, Hui,	2008	All	Malaysia-101	OLS	Continuous	✓	✓	✓	✓	✓	✓	✓		
5	Tungsong	2010	All	Thailand-Indonesia-315	Logit	Binary	✓		✓	✓					
6	Lantara	2012	All		Probit/Tobit	Binary/ Continuous	✓		✓	✓		✓	✓		
7	Ahmad and Haris	2012	All	Malaysia-110	Logit	Binary	✓		✓	✓					
8	Shaari, Hasan, Palanimally, Mohamed,	2013	All	Malaysia-97	Panel Least squares	Continuous	✓		✓	✓			✓		
9	Chong, Change, Tan	2014	FC	Malaysia – 219	Survey										

Panel B: Studies investigating the relationship between derivatives use and firm value

No	Authors	Year	Are of study	Country & Sample size	Methodology	Dependent variables	Main explanatory variables	Effects of derivatives use on firm value		
								Increase	Decrease	No effect
1	Ameer	2009	FC& IR	Malaysia-40	OLS	Share price	Derivative notional value	✓		
2	Yin and Qui-qi	2010	FC& CP	China – 295	Tobin's Q	Tobin's Q	Derivative dummy	✓		
3	Oktavia	2012	All	Indonesia-160	OLS	Price to book value ratio	Derivative notional amount	✓[a]		✓[b]

Panel C: Studies investigating the relationship between derivatives use and exposures

No	Authors	Year	Are of study	Country & Sample size	Methodology	Dependent variables	Main explanatory variables	Effects of derivatives use on exposures		
								Increase	Decrease	No effect
1	He and Ng	1998	FC	Japan-171	Market model	FC exposure	Firm's export ratio		✓	
2	Ameer, Isa, Abdullah	2011	FC	Malaysia-60	OLS	Cost of equity capital	Derivative notional value			✓

Note: "All" means foreign currency derivatives, interest rate derivatives and commodity price derivatives. "FC", "IR", and "CP" mean foreign currency derivatives, interest rate derivatives, and commodity price derivatives, respectively. Upper *a* refers to results for non-financial firms; Upper *b* refers to results for b

CHAPTER 4

EMPIRICAL ANALYSIS OF DETERMINANTS OF DERIVATIVES USE IN EAST ASIAN NON-FINANCIAL FIRMS

4.1. Introduction

Derivatives are an important risk management instrument used by 90 percent of Fortune 500 companies (Bartram, Brown, and Conrad, 2011). The Bank for International Settlements (2014) reports that the global over-the-counter derivatives notional amount outstanding was $691 trillion at the end of June 2014. The rationale behind hedging, however, has not been well sustained. Hedging theories suggest that using derivatives increases the value of firms by addressing market imperfections, such as taxes, agency problems, bankruptcy, and financial distress. Nevertheless, empirical evidence (Graham and Rogers, 2002; Charumathi and Kota, 2012) lends little support to these theories. Bartram, Brown, and Fehle (2009) indicate that traditional theories have little power to explain decisions regarding the use of derivatives. The inconclusive evidence may arise from the fact that most existing studies consider only firm-specific factors as determinants of hedging behavior, while the characteristics of the country where a firm operates may influence its decision to use derivatives. While firm determinants alone cannot fully explain firms' behaviors, little is known about the role of country-specific factors in shaping firms' decisions to use derivatives.

Using unique hand-collected data on derivatives use, we contribute to the literature by incorporating country-specific factors, particularly governance quality, to explore firms' hedging behavior. We focus the analysis on a sample of 9,691 observations from eight East Asian

countries during the period of 2003–2013. This sample was chosen for the following reasons. Firstly, although the literature on derivatives use has been growing, most empirical studies focus on the derivatives usage of U.S. non-financial firms. There is also a growing body of literature on derivatives in developed and emerging economies, yet research on the hedging behavior of East Asian firms is still relatively scarce, even though they have become the world's key derivatives users.[4] Secondly, our sampled firms are located in countries with great variance in terms of economic, political, and social environments. Such variation gives us a unique opportunity to explore whether a country's characteristics determine derivatives use independently from firm-specific factors. Country heterogeneity also allows us to focus on differences in governance mechanisms that are arguably exogenous to firms' derivatives use. Lastly, given that many of our firms (nearly 45%) are domestic and 48.23 percent are domestic multinational corporation (MNC) headquarters, we would expect the role of country-specific characteristics to become more salient in determining derivatives use.

The main findings of our study can be summarized as follows. Results from both univariate and multivariate analyses reveal that governance mechanisms have a strong positive effect on firms' decisions to use derivatives. Firms are more likely to use derivatives, and use them more extensively, when they are located in countries with lower corruption levels. In countries with better governance mechanisms, firms use derivatives to hedge exposure, yet in weakly governed or highly corrupt countries, firms do not use derivatives for risk management but rather for

[4]According to the annual survey of the Future Industry Association in 2014, the trading volume in Asia-Pacific is $7.25 billion, accounting for about one-third of global trading volume.

speculative and/or selective hedging. We also find that countries with higher degrees of economic, financial, and political risks encourage firms to use derivatives.[5]

We proceed with the remainder of this chapter as follows. Section 2 reviews the literature on incentives for derivatives use, discusses the existing empirical literature on country-specific factors, and develops hypotheses. Section 3 describes our sample and identifies variables. Section 4 presents empirical specifications. Section 5 reports empirical analyses and robustness tests. Section 6 concludes the chapter.

4.2. Theoretical framework and hypotheses

4.2.1. Hedging theory and derivatives use

Modigiliani and Miller's (1958) seminal paper shows that in an efficient market, the financing policies of firms are irrelevant; that is, hedging or derivatives use does not affect firm value. Hence, the incentives of hedging depend on the degree to which the use of derivatives effectively addresses market imperfections, such as corporate taxes (see Smith and Stulz, 1985; Mayers and Smith, 1990), financial distress or bankruptcy costs (see Nance, Smith, and Smithson, 1993; Froot, Scharfstein, and Stein, 1993), or agency costs of debts (see Mayers and Smith, 1982; Bessembinder, 1991).

[5] Further, we notice that the effects of country-specific characteristics on the use of derivatives somewhat depends on underlying assets of derivatives contracts. Our findings are also robust to specifications in which we estimate the relation between firms' derivatives use and country-level factors by using lagged variables and random effect models to account for endogeneity concerns related to firms' derivatives use, country-specific characteristics, and countries' financial policies. We also conduct a set of alternative tests to gauge the robustness of the results, including country-random-effects specification with a Tobit model to analyze the impact of country-level factors on determinants of derivatives use and pooled models with measures of the strength of governance mechanisms to control for multicollinearity.

Existing evidence, however, provides mixed support for hedging theories. Judge (2006a) finds a strong relationship between financial distress costs and foreign currency hedging decisions, much stronger than that found in many previous studies in the U.K. Recently, Chen and King (2014) examined 1,832 U.S. non-financial firms and presented significant evidence consistent with financial distress cost arguments. In contrast, Charumathi and Kota (2012) state that there is no evidence supporting this hypothesis. Supanvanij and Strauss (2010) find that tax loss carried forward is an important factor in determining the use of foreign currency derivatives, while Kumar and Rabinovitch (2013) indicate that foreign tax credits are in the direction hypothesized and firms use derivatives to increase the present value of tax losses. In contrast, Sprcic and Sevic (2012) find that the evidence in favor of the tax hypothesis is very weak, while Gay, Lin, and Smith (2011) do not find any evidence in support of the tax incentive to increase debt capacity.

Empirical studies on testing the agency costs of debt theory also provide inconclusive evidence. Chen and King (2014), among others, find evidence to support the agency costs of debt theory. However, Charumathi and Kota (2012) do not find evidence in support of the agency costs of debt hypothesis. This finding is consistent with a recent study by Lievenbruck and Schmid (2014) and earlier studies such as Nance *et al.* (1993).[6]

4.2.2. Institutional theory and country-specific characteristics

The institution-based view argues that a network of firms is a coordinated system of value-added activities whose structure is determined by the institutions that control or affect firms' objectives and behaviors (Dunning, 2003). North (1990, 1994) was among the first to emphasize the importance of institutions. He considers institutions much more than background conditions

[6] Overall, Guay and Kothari (2003) suggest the need to rethink the past empirical research on firms' derivatives use.

and defines institutions as “rules of the game,” including the formal rules (laws, regulations) and informal constraints (customs, norms, cultures) that organizations face. Institutions shape firm actions by determining transaction costs and transformation costs of production. As such, institutions play a key role in determining the organizational outcomes and effectiveness of organizations (Khanna and Rivkin, 2001) as well as framing their organizational strategic choices (Peng, Lee, and Wang, 2005).

Therefore, to better understand the determinants of firms’ activities and their effects, it is necessary to consider institutional influences inside the firm and the external environment where firms operate simultaneously. Dunning and Lundan (2008) introduce a theoretical framework in the context of the OLI paradigm (Dunning, 1988) in order to accommodate both firm- and country-specific considerations. The *ownership* advantages (O) in the OLI paradigm now include institutional ownership advantages (Oi), which comprise the firm-specific characteristics and an indentation of the institutional environment (L attributes) (Cantwell, Dunning, and Lundan, 2010). On the other hand, the institutionally related *location* advantages of countries (Li) allow for the interdependence between the firm and national institutions on both the micro and macro levels.

Regarding the literature on hedging, although studies on traditional hedging theories are abundant, few empirical studies have investigated the link between differences in cross-country characteristics and firms’ use of derivatives. Furthermore, the findings of these studies provide mixed evidence. For example, Lievenbruck and Schmid (2014) together with Lel (2012) obtained a significant association between GDP per capita and the use of derivatives in the predicted directions, although Lievenbruck and Schmid only found supporting evidence in the case of commodity price derivatives use. The effect of financial risk is always statistically

significant but inconsistent with the hypothesized prediction (see Bartram *et al.*, 2009). Likewise, regulatory quality and long-term interest rates are insignificant, while the effect of inflation rate and long-term exchange rate are very weak (see Bartram *et al.*, 2009; Livenbruck and Schmid, 2014).

Our study explores countries with great variances in terms of economic, political, and social environments. Hence, we expect to observe differences in derivatives use due to the differences in country risks and governance mechanisms.

Governance mechanisms

According to Globerman and Shapiro (2003), governance mechanisms consist of institutions and policies targeting economic, legal, and social relations. Good governance mechanisms value "independent judiciary and legislation, fair and transparent laws with impartial enforcement, reliable public financial information and high public trust" (Li, 2005, pp.298). As such, good governance mechanisms are able to reduce transaction, production, and R&D costs, leading to reductions in the variability of firms' profitability and high-return, low-risk investments (Ngobo and Fouda, 2012). They implement policies that favor free and open markets and form effective and non-corrupt institutions (Globerman and Shapiro, 2003). On the contrary, poor governance mechanisms increase costs and uncertainty (Cuervo-Cazurra, 2008), and they can lead to smaller, more volatile, and less liquid stock markets in emerging economies (Lin *et al*. 2008) as well as a lack of transparent financial data and other information on firms and a shortage of specialized financial intermediaries (Khanna, Palepu, and Sinha, 2005).

In this study, we investigate two aspects of governance mechanisms: corruption and quality of governance system. While the concept of corruption is widely studied in the economics and international business areas, to our knowledge, there is currently no research linking corruption

with derivatives use in the literature. Bardhan (1997), Quazi (2014), and others view corruption as a "grabbing hand," because it increases uncertainty and transaction costs, and one major cause of corruption is bad governance mechanisms (Lambsdorff, 2006). When it is costly to transact, institutions matter, and when institutions matter, it is costly to transact (North, 1993). Thus, firms in highly corrupt countries may face higher transaction costs due to bribe payments and related expenses (Brouthers, Gao, and McNicol, 2008), which in turn leads to higher hedging costs.[7] Building upon this insight, we propose the following hypothesis:

Hypothesis 1: Firms located in countries with higher corruption levels are less likely to use derivatives.

Considering a globalized macroeconomic environment, we wonder whether corruption influences firms' decisions on derivatives use through firm-specific and country-specific characteristics. Conditional on the levels of corruption, various factors might play a role in explaining a firm's hedging behavior. Petrou (2015) along with Petrou and Thanos (2014) show that corruption often generates additional difficulties rather than opportunities for firms to benefit from non-market environments. In addition, a high level of corruption is associated with a sophisticated bribery system, discouraging firms from using derivatives as a risk management tool. We thus propose the following hypothesis:

Hypothesis 1a: High levels of corruption discourage firms from using derivatives to reduce exposure as stated by hedging theory.

[7] Along this line, abundant empirical evidence indicates that corruption directly deters economic growth and development, causing the business environment to become more uncertain and less favourable for profit making and firm performance (e.g., Lee and Hong, 2012; Petrou, 2015).

Likewise, we expect a positive relationship between firms' use of derivatives and quality of governance mechanisms. Several studies motivated by La Porta *et al.* (1997, 1998) emphasize that legal institutions (either laws or enforcement) play a significant role in explaining cross-country differences in financial development, decision-making, and valuation, because laws and the quality of their enforcement determine the rights and operation of firms participating in financial systems. Beck and Levine (2008) note that finance can be considered a set of contracts. Because derivatives are financial contracts, we expect that legal institutions are likely to influence derivatives use. Finally, Bevan *et al*. (2004) note that an efficient legal infrastructure reduces institutional uncertainty as well as facilitates contract establishment and lowers transaction costs. We therefore propose that better governance mechanisms encourage firms to enter into derivatives contracts given the lower cost of hedging.

Hypothesis 2: Firms located in countries with higher governance quality are more prone to use derivatives.

Country risks

Shapiro (1999) defines country risk as the general level of political and economic uncertainty in a country influencing the value of investments in that country. Allien and Carletti (2013) further indicate that the interactions of institutions and markets determine the country risks that drive firms' activities (Cantwell *et al.,* 2010). Relatedly, uncertainties in government policies and the economic environment may lead to a higher cost of capital faced by firms due to the increased probability of financial distress, so firms tend to have greater exposure (Huang *et al.,* 2015; Glover and Levine, 2015). Under the influence of a host country's uncertainty, an increase in the production of an MNC subsidiary there decreases the production of other subsidiaries within the same MNC network (Lee and Song, 2012).

Although the topic of political and economic uncertainty has been investigated extensively, there has been little discussion of the link between derivatives use and country risks. Batram *et al.* (2009) state that firms located in countries with greater economic, financial, and political risks are more likely to use derivatives. On the other hand, firms based in less risky countries may have lower expected financial distress costs and less need for risk management. Recently, Azad, Fang, and Hung (2012) found evidence consistent with the argument that greater macroeconomic risk induces firms to use derivatives more.

Hypothesis 3: Firms in countries with higher country risk have more incentive to use derivatives.

To sum up, using derivatives to manage risk is a complex decision that may involve various factors. Hedging theories focus on the role of firm-specific factors. Institutional theory, on the other hand, stresses the importance of incorporating country factors to explore firms' behavior in derivatives use. In this paper, by combining hedging and institutional theories into a single framework of analysis, we complement and shed new light on the current literature on derivatives use. We also provide new insights into the nature of firms' hedging behaviors. In doing so, we address some open questions on the determinants of derivatives use.

4.3. Sample and data

4.3.1. Sample

We focus the analysis on 881 non-financial firms across industries for the period of 2003–2013. These firms we relocate in eight East Asian countries: Singapore, Hong Kong, the Philippines, Thailand, Malaysia, Indonesia, China, and Japan. Our sample spans beyond the global financial crisis in 2007–2008, which generated real exogenous shocks to firms. Under such volatile environments, it is instructive to study why and how firms decide to use financial

derivatives. We present the construction of the sample and the data-collection procedure in detail below.

Following most prior studies, we selected the top-listed companies ranked by market capitalization on the stock exchanges of the eight countries in the sample. Large firms were chosen for two important reasons. Firstly, large firms were more likely to be involved in international business activities and thereby have exposure to financial risks. As many firms are expected to have exposure to financial risks, our sample potentially provides a rich cross-section of derivatives users and non-users. Secondly, there was a high likelihood that large firms were actively encouraged to report their derivatives usage in their annual reports during the sample period. We excluded firms that did not have annual reports in English or did not have all annual reports from 2003–2013.

It is worth noting that many firms in our sample were cross-listed. A disadvantage of using cross-listed firms is that they may be subject to governance regulations by both home countries and foreign countries, making the measurement of the strength of governance mechanisms challenging. However, in our sample, domestic firms account for 44.51 percent, domestic MNCs account for 48.23 percent, and the proportion of foreign MNC affiliates is 7.26 percent (untabulated), so the home country governance mechanisms of our sample firms had primary effects on firms' derivatives use. On the other hand, foreign affiliates' performance and strategic actions are always affected by the institutional context of the host country in which they are embedded (see Chan, Isobe, and Makino, 2008; Spencer and Gomez, 2015; Makino, Isobe, and Chan, 2004). To address this issue, we run the regressions for the whole sample as well as for a subsample that included only domestic firms and found consistent results between these two samples. In addition, both Allayannis, Brown, and Flapper (2003), using a sample of East Asian

firms, and Lel (2012) found no difference in the derivatives usage of cross-listed firms and those that are not cross-listed. These insights enable us to use this sample of firms to investigate the effect of the quality of a firm's home country governance on its hedging activity.

We collected the information on derivatives use and some explanatory variables from firms' annual reports. Currently, information on the notional principal amount of derivatives instruments is grouped with off-balance sheet items; therefore, there is no database containing data on the derivatives usage of non-financial firms in East Asian countries. Hence, we hand collected these data directly from annual reports. We strived to verify the data accuracy by searching through a subset of firms' annual reports, in which the electronic annual reports in PDF format were obtained via the websites of each firm, Morningstar [8] (an independent investment research firm that provides a direct link to each company's annual recent reports), or the stock exchanges of each country. As the eight countries in our sample had different local currencies with different values, it could have resulted in a sampling bias. Hence, we decided to use a common currency to represent the amount of derivatives use and all other financial data, and we chose United States dollars (USD). For annual reports in which the reporting currency was not USD, all hand-collected data were converted into USD using the exchange rates on the Datastream database.

We augmented this database on derivatives usage from annual reports with financial data on explanatory variables from the Datastream database. For data not available on Datastream, we searched the annual reports of firms to fill in as much missing data as possible. Some country-specific data such as corruption indices were obtained from the Transparency International (TI)

[8] http://quote.morningstar.com/stock-filing/Annual-Report/

and reports of central banks of sample countries, while proxies for governance mechanisms were obtained from the World Bank. All financial data were yearly and in thousands of USD.

Descriptive Statistics of Sample

Panel A in Table 4.1 below shows that across the entire sample, more than half (53.5%) use at least one type of derivatives, and 100 percent of firms in Japan, Thailand, and the Philippines used some kind of derivative during the sample period. The most commonly used instruments are foreign currency derivatives (42.55%), followed by interest rate derivatives (25.81%) and commodity price derivatives (8.99%). When we examine derivatives use by major industry (untabulated), we find that usage rates are highest in the chemicals and construction and mining machinery industries and lowest in the materials and aerospace and defense industries.

(INSERT TABLE 4.1 HERE)

Panel B presents how derivatives use changed over time. We divide the sample into three periods based on the global financial crisis. Derivatives are used more frequently over time, increasing from 49.72 percent in the 2003–2006 period to 54.14 percent in the 2007–2008 period and 55.89 percent in the 2009–2013 period. The boost in derivatives usage in 2009 onward corresponds to the global financial crisis; specifically, the number of firms using foreign currency derivatives increases from 36.71 percent in the pre-crisis period to 46.08 percent in the post-crisis period.

4.3.2. Dependent variables

To examine both the decision to use derivatives and the intensity of derivatives use, we considered two kinds of dependent variables. To measure a firm's likelihood of using derivatives, we constructed a binary variable with the value of one or zero depending on whether a firm used derivatives. To measure a firm's intensity of using derivatives, we constructed a

continuous variable defined as the total notional amount of derivatives contracts scaled by the firm size for a user and zero for a firm that does not use derivatives. We searched annual reports for information on derivatives use and classified firms as derivatives users if their annual reports specifically mentioned the use of any type of derivatives contracts (i.e., forwards, swaps, futures, or options). Almost every firm stated that they did not enter into derivatives contracts for trading or speculation purposes; we therefore assumed that all firms in our sample used derivatives mainly for hedging.

We do not use accounting definitions, because accounting standards differ across countries and accounting classifications do not always reveal a firm's intention inholding a derivative position. We focused on textual descriptions; as such, a firm was classified as a derivatives user if it had any numerical or narrative disclosures of derivatives use in the fiscal year. The binary variable is an effective measure of derivatives usage given the nature of our sample. Applying this measure, we are able to investigate the use of derivatives for a large sample of firms over a long period of time. Consistent with the literature (e.g., Allayannis and Ofek, 2001; Guay and Kothari, 2003; Lievenbruck and Schmid, 2014), we then constructed derivatives use to total assets as the dependent variable. This derivatives usage ratio is censored at zero by construction.

4.3.3. Independent variables

4.3.3.1. Country-specific variables

To measure country risk, we use the overall risk rating scores (i.e. average of the scores for sovereign risk, currency risk, and banking sector risk of each country on a scale from 0 (minimum risk) to 100 (maximum risk)) provided by the Economist Intelligence Unit.

We use two sets of proxies for governance mechanisms: corruption and quality of governance. To measure the corruption level, we collected the Corruption Perception Index

(CPI) from the TI, ranging from 0 (highly corrupt) to 100 (very clean). Quality of governance mechanisms is constructed using three measures. The first is the rule of law, which is a proxy for the quality of law enforcement. The second is regulatory quality, which measures the governmental ability to formulate and implement sound policies and regulations. The last is government effectiveness, which measures the quality of public and civil services and the credibility of the government's commitment to policies. All these variables are on a scale from -2.5 (weak governance) to 2.5 (strong governance), and they were obtained from the World Bank.

We implemented Pearson correlations for country-specific variables (untabulated). The pair-wise correlations showed that rule of law, regulatory quality, and government effectiveness was highly correlated, suggesting that some of these variables should be dropped in the multivariate analysis. Therefore, we only use government effectiveness, which represents the overall legal system, in the following analyses.[9]

4.3.3.2. Firm-specific variables

To test traditional hedging theories, we employ the most standard variables identified in the extant literature. Firstly, we use two measures of borrowing capacity as proxies for a firm's pre-hedging probability of financial distress: financial leverage and interest coverage. Secondly, we measure three aspects of the firm's effective tax function: deferred taxes. Following Kumar and Rabinovitch (2013), we also use the range of a firm's tax rate as a proxy for the progressive region of the tax schedule and expected positive coefficients on these variables. Thirdly, three sets of variables are developed to capture the essence of the conditions underlying the agency costs of debt hypothesis: leverage ratio, ratio of market to book value, and current ratio.

[9]The results are almost the same if we use the other two variables instead of government effectiveness.

We also control for the existence of other means of financial hedging—convertible debts, preferred stocks, current ratio, and dividend payout—as firms issue these debt instruments and liquid assets instead of hedging with derivatives (Nance *et al.*, 1993). In addition, we control for firm size, which is measured by the natural logarithm of total assets. We expect this variable to have a positive effect on derivatives use.

(INSERT TABLE 4.2 HERE)

4.3.4. Control variables

Other country-level factors could have been confounded with governance quality proxies to affect firms' hedging behavior. Thus, we control for such country effects and country's time-invariant characteristics by using GDP per capita ratio to proxy for the relative performance of the countries and financial system deposits to GDP (defined as demand, time, and saving deposits in deposit money banks and other financial institutions as a share of GDP) to proxy for financial market development. These variables were obtained from the World Bank's World Development Indicators. Further, we control for the exposure that a firm may face by employing the ratio of foreign sales to total sales and the ratio of foreign assets to total assets. Positive coefficients on these variables are expected.

4.4. Models for investigating determinants of derivatives use

In this thesis, we will analyze all aspects of determinants of derivatives use by firms. As such, we first investigate factors affecting firms' decision to use derivatives, and then we scrutinize determinants of the extent of derivatives usage, alternatively, examine how much firms use derivatives.

4.4.1. Models for testing decision to use derivatives

In the previous studies, analyses of firms' decision to use derivatives are widely carried out by logit or probit model. In these models, dependent variable is binary, which is coded as a 1 for those firms using derivatives, and 0 for those firms not using derivatives. As such, the basic logic is that firm faces a decision with two options, to use derivatives or not to use derivatives, and its decision hinges on its facets. The primary goal of the model is to predict the probability that a firm with certain set of attributes will use derivatives, and so find out what factors determine the likelihood of derivatives usage.

The logit model is based on logistic distribution function, while the probit model is based on normal cumulative distribution function. Logit or probit model can be expressed as below:

$$y_i^* = \beta_0 + \beta x + e, \quad y_i = \begin{cases} \mathbf{1}\ \boldsymbol{if}\ \boldsymbol{y_i^* > 0} \\ \mathbf{0}\ \boldsymbol{if}\ \boldsymbol{y_i^* \leq 0} \end{cases} \qquad (4.1)$$

Where:

y_i: A binary dependent variable, taking a value of 1 if a firm uses derivatives, and 0 otherwise

y_i^*: An unobserved or latent variable. In this case y_i^* is defined as propensity of using derivatives. The subscript *i* indexes observation

x: The full set of explanatory variables

β: Set of parameters

e: Error term with either standard logistic distribution or the standard normal distribution.

From the equation (4.1), the response probability for *y*, referring to the likelihood that a firm with the given values of explanatory variables will use derivatives, can be derived as follows:

$$P(\boldsymbol{y_i}|\boldsymbol{x}) = P(\boldsymbol{y_i^* > 0}|\boldsymbol{x}) = P\ [\boldsymbol{e} > -(\boldsymbol{\beta_0} + \boldsymbol{\beta x})|\boldsymbol{x})] = 1 - F[-(\boldsymbol{\beta_0} + \boldsymbol{\beta x})] = F(\beta_0 + \beta x) \qquad (4.2)$$

Where:

F: Distribution function, which is logistic function in logit model, and normal distribution function in probit model

The coefficients β represent the marginal effects of x on the latent variable y_i^*

The marginal effect of an explanatory variable x_i measures changes in the probability of using derivatives by firms when x_i changes by one unit, keeping other explanatory variables unchanged. It is the slope of the logistic function or normal distribution function with regard to each of the explanatory variables. Because this slope is not constant, the marginal effect of a given explanatory variable also varies.

The marginal effect of an independent variable x_i, which is not related to other explanatory variables, can be derived as below:

a) If x_i is continuous variable, then marginal effect will be:

$$\frac{\partial \boldsymbol{P_i(y|x)}}{\partial \boldsymbol{x_i}} = \frac{\boldsymbol{e^{Z_i}}}{\boldsymbol{(1+e^{Z_i})}}\boldsymbol{\beta_i}$$

Where: $Z_i = \beta_0 + \beta_i x_i$

b) If x_i is dummy variable, then marginal effect will be:

$$\frac{\partial \boldsymbol{P_i(y|x)}}{\partial \boldsymbol{x_i}} = \boldsymbol{P(y=1|\bar{x}_i, x_i=1) - P(y=1|\bar{x}_i, x_i=0)}$$

Where:

$\boldsymbol{\bar{x}_i}$ represents the mean of all variables in x, other than x_i

The marginal effect of a continuous variable is the effect of one unit change in the explanatory variable on the response likelihood. We can see that for any pair of continuous variables, the relative effects do not depend on x as the ratio of the marginal effect is constant and equal to the ratio of the corresponding coefficients. Whereas the margin effects of a dummy

is the difference between the estimated probabilities estimated at the two values of the binary variables of interest, other things remain unchanged.

Interestingly, although logit and probit model are based on different distribution function, the marginal effects and predicted probabilities from logit and probit models tend to be quite similar. Therefore, the choice between the two models is not an important issue. However, the probit model is more popularly used than logit model, because economists tend to favor normal distribution, and several specification problems are most easily analyzed using probit model due to properties of normal distribution (see Wooldridge, 2013, pp.562). In view of this, this thesis will employ probit specification to analyze the factors affecting firms' decisions to use derivatives.

4.4.2. Models for testing the extent of derivatives use

On contrary to treating derivative usage as a binary variable, prior empirical studies explore it as a continuous variable to investigate determinants of derivatives usage. That measure is constructed by using data on amount of derivatives used by firms, that is notional value or fair value, scaled by total assets or total sales, while those firms not using derivative has zero value for that measure. In such that way, existing studies apply censored regression models as dependent variable is continuous, but observed only on a limited range and there are no firms with negative derivatives use. In the following section, we will review the most widely used model, that is, Tobit model.

Preceding studies usually use Tobit model to examine both firms' decision to use derivatives and decision on how much firms use derivatives. This is because Tobit model is quite appropriate for purposes of having a model that implies nonnegative predicted value for the use of derivatives, and that has sensible partial effects on a wide range of the independent variables.

Especially, in the case they want to estimate characteristics of the distribution of derivatives usage with given explanatory variables rather than the conditional expectation (see Wooldridge, 2013, pp.573)

Let *y* be observed extent of derivatives use that is essentially continuous for the firms using derivatives, and takes on a value of zero for those firms not using derivatives. Basically, the Tobit model, which is originally proposed by Tobin (1958), exhibits the observed response, y_i, as an underlying latent variable as below:

$$y_i^* = \beta_0 + \beta x + u, \quad \boldsymbol{u}|x \sim \boldsymbol{N}(\boldsymbol{0}, \boldsymbol{\sigma^2}), \qquad y_i = \begin{cases} \boldsymbol{y_i^* \; if \; y_i^* \geq 0} \\ \boldsymbol{0 \; if \; y_i^* < 0} \end{cases} \tag{4.3}$$

Where:

y_i^*: A latent continuous variable. The subscript *i* indexes observation

x: The full set of explanatory variable

β: Set of parameters

u: Error term is independently and normally distributed, with mean zero and a variance $\boldsymbol{\sigma^2}$

As Tobin (1958) shows, given that $z = \beta x/\sigma$, the expected value of y_i and y_i^* in the model is expressed as follows:

$$E(y_i) = \boldsymbol{\beta x F(z) + \sigma f(z)} \tag{4.4}$$

$$E(y_i^*) = E(\boldsymbol{y|y > 0}) = \boldsymbol{E((y|u > -\beta x) = \beta x + \sigma f(z)/F(z)} \tag{4.5}$$

So,

$$E(y_i) = F(z)\, E(y_i^*) \tag{4.6}$$

Where:

f(z): Standard normal distribution

F(z): Cumulative normal distribution function

From these above equations, the effect of a change in the x_i on y (the marginal effect) is estimated. In this thesis, there are two kinds of marginal effects. The first one is the marginal effect on the probability, which is not censored, that is firms' decision of whether to use derivatives. The second one is the marginal effect on the expected on being not censored that is the extent of derivatives use or decision to how much to use derivatives. The two marginal effects are expressed as follows:

a) $$\frac{\partial Prob\,(y_i>0)}{\partial x_i} = \frac{\beta_i}{\sigma} f(z)$$

b) $$\frac{\partial E(y_i|y_i>0, x_i)}{\partial x_i} = \beta_i \left[1 - z\frac{f(z)}{F(z)} - \frac{f(z)^2}{F(z)^2}\right]$$

A key limitation of the tobit model is that the probability of a positive value and the actual value, given that it is positive, are determined by the same underlying process, i.e the same parameters. Particularly, in the case of being applied here, Tobit model implies the decision on whether to use derivatives or not to use derivatives, and decision on extent of derivatives use are both determined by the same latent dependent variable y^*. In other words, Tobit model constraints the coefficients on the factors determining the use of derivative to be the same as those determining the amount of derivative usage. The implication of Tobit model is that a firm's decision on derivatives usage may include two steps together: determining whether to use or not to use derivatives, and then determining the extent of using derivatives, if it uses. However, in some situations, decisions on to use derivatives and on the amount of using derivatives may not be so intimately related. For example, the probability that a firm use derivatives and the amount of derivatives use when it uses might both hinge on firm size, but in opposite directions. Alternatively, the effect of a specific factor on a firm's decision to use derivatives can be different from the effect of the same factor on the extent of derivatives use by those firms have

determined to use derivatives. Therefore, it is impossible to model the differential response between the decision equation and the extent of participation equation in a simple Tobit model, as there is only one equation with a unique coefficient on each variable.

4.4.3. Modeling procedures

Following our discussion above, we estimate a series of probit models and tobit models in general forms as Equation (4.7) and Equation (4.8) below:

$$Probability\ (Derivative\ use)_{it} = f\ (Firm\text{-}specific\ variables,\ country\text{-}specific\ variables) \quad (4.7)$$

$$Derivative\ use_{it} = f\ (Firm\text{-}specific\ variables,\ country\text{-}specific\ variables) \quad (4.8)$$

Where:

Probability (Derivatives use) is a binary variable that indicates whether firm *i* uses derivatives at year t.

Derivatives use is a continuous variable that is measured by the notional amount of derivatives contracts scaled by total assets.

Country-specific variables include proxies for country risk and governance mechanisms.

Firm-specific variables are the aforementioned variables that are used in testing value-creation theories through hedging and control variables for exposure to financial risks.

It is worth noting that in our analysis, we use country random effects to focus on the effects of country-level factors and the variance component structure, as the main explanatory variables were at the country level and time invariant.[10]Our approach is in line with Bryan and Jenkins'

[10]We also performed the Hausman tests on the random-effects versus the fixed-effects model. The result showed that the random-effects model gave better fit.

(2013) insight that the country-random-effects approach is more efficient than the fixed-effects approach, as it "borrows strength" from between-group variation, while the fixed-effects approach uses only within-group variation. We also use industry and year fixed effects to measure the within-industry differences in the effect of country-level factors on firms' derivatives usage and control for unobserved time-varying effects. In addition, following Rogers (1993), we employ a clustering method to adjust for the heteroscedasticity and serial correlation of standard errors.

4.5. Results and discussion

4.5.1. Univariate results

Panel A of table 4.3 presents determinants of derivatives use by country-specific variables. First, corruption levels and other proxies for quality of governance mechanisms could be very important factors. Derivatives users are more often located in better-governed countries with lower corruption levels, higher government effectiveness, and higher quality of law enforcement. Second, other results related to country risks, in spite of being statistically different from zero, reveal only very small economic differences between derivatives users and non-users.

(INSERT TABLE 4.3 HERE)

The univariate tests suggest that users of foreign currency derivatives and interest rate derivatives are not statistically different from non-users with respect to bankruptcy costs and costs of financial distress. For commodity price derivatives, the result is mixed. Although the leverage is statistically significant and lower for derivatives users, differences in interest coverage ratios between users and non-users are insignificant. Overall, other results with respect to proxies for corporate tax and agency costs of debt are weak and in some instances inconsistent

with the theories. In addition, the insignificance of foreign assets to total assets, and foreign sales to total sales is in line with the notion that firms may not use derivatives for hedging exposure.

4.5.2. Multivariate analysis: Determinants of the decision to use derivatives

4.5.2.1. Pooled Probit results

* Analysis by country-specific factors

In line with Hypothesis 1, we find that corruption is positively and significantly associated with a firm's likelihood of using derivatives. This result may be attributed to a lower transaction cost associated with lower corruption. Put differently, lower corruption enables firms to enter financial derivatives contracts at a lower cost. Likewise, consistent with Hypothesis 2, there exists a significant and positive effect of government effectiveness on a firm's tendency to use derivatives. This result is due to the fact that a well-functioning legal system and high legal enforceability lower the costs of contracting and administrating, thereby facilitating firms 'use of derivatives.

(INSERT TABLE 4.4 HERE)

Taken together, these findings suggest that good governance increases a firm's inclination to use derivatives. Relatedly, firms in weakly governed countries are likely to use derivatives for purposes other than reducing exposure to financial risks. In particular, when examining the proxies for exposure, we find the coefficient estimates of all other proxies are insignificant; implying that exposure to financial risks does not play an important role in the determinants of a firm's derivatives usage. This finding is similar to that of Allayannis *et al.* (2003), who found that there is no evidence that East Asian firms eliminate their foreign exchange exposure by using derivatives.

The estimated coefficient on overall risk rating, the proxy for country risk, is positive and statistically different from zero. This finding supports Hypothesis 3 and implies that firms in more risky countries are more likely to use derivatives to manage a higher level of exposure to market risks.

* Analysis by type of derivatives

We find that the results somewhat depend on the underlying assets of derivatives contracts. *In the case of foreign currency derivatives*, broadly similar to the results obtained for the use of any derivatives, we find a positive and statistically significant association between government effectiveness, overall risk rating, and firms' decisions to use derivatives. *Conversely, for the use of interest rate derivatives,* government effectiveness does not affect firms' likelihood of using derivatives, although there exists strongly significant link between the use of interest rate derivatives and corruption and overall risk rating. *For the use of commodity price derivatives*, notably, the results lie in stark contrast to the results of any derivatives, foreign currency derivatives, and interest rate derivatives use when we are unable to find any evidence that there is a link between governance mechanisms and country risk and firms' decisions on using derivatives. However, opposite to the finding of Lel (2012) that the use of commodity price derivatives is mostly industry-specific, we observe that the coefficient on corruption is always significant and positive, suggesting that a country's governance quality has a strong impact on a firm's decision on using that type of derivatives.

4.5.2.2. Pooled Probit results based on corruption levels

In this section, we replicate pooled probit regressions with respect to the corruption level. We group countries into low and high corruption levels based on the scales of the CPI as defined by the TI. The low corruption level group consists of all countries having scores equal to or

greater than 75, whereas any country with a CPI score less than 75 is placed in the high corruption level group. In that way, we can identify the factors that might or might not be determinants of derivatives usage by firms located in countries with low corruption and the factors most likely to affect firms' decisions when they are influenced by high corruption.

(INSERT TABLE 4.5 HERE)

When the corruption level is low, the results show that governance mechanism quality is a significant determinant explaining why firms use derivatives, but traditional hedging theories have very little power to explain why firms use derivatives. In particular, we find mixed supporting evidence for the hypothesis of bankruptcy and financial distress costs: Leverage is positively related with firms' likelihood of using derivatives, while the interest coverage ratio is never different from zero at any significance level. Consistent with Gay *et al.* (2011) and Sprcic and Sevic (2012), we do not find any significant evidence of a link between proxies for corporate tax and firms' probability of using derivatives, as they are statistically significant but counter to the hypothesized sign. In line with Géczy, Minton, and Schrand(1997) and Allayannis and Ofek (2001), we do not find any link between agency costs of debt and decisions on derivatives use by firms in countries with low corruption.

The significant and positive coefficient estimates of foreign sales to total sales and leverage, however, suggest firms with greater exposure to exchange rate and interest rate risks are more likely to use derivatives. This result indicates that firms in countries with low corruption appear to use derivatives to mitigate exposure to financial risks rather than to speculate, in line with arguments about speculation of prior studies such as Géczy *et al.* (1997) and Júnior (2013).

When we analyze the results by type of derivatives, we find that the driving factors of firms' decisions on using derivatives vary somewhat among the types of derivatives, and there is still a

lack of supporting evidence for traditional hedging theories. Specifically, when a firm makes a decision on derivatives usage in the situation of low corruption, leverage is a significant determinant. However, if coefficients on leverage are significant and with the predicted sign in the case of foreign currency and interest rate derivatives use, the negative effects for leverage in the case of commodity price derivatives use are counter to the hypothesis of bankruptcy and financial distress costs. These results indicate that firms use foreign currency and interest rate derivatives more aggressively when the costs of financial distress are higher. Similarly, firm size is an important factor influencing firms' likelihood of using foreign currency derivatives, while it does not affect firms' decisions in the case of interest rate and commodity price derivatives.

When the level of corruption is high, the factors influencing firms' decisions on using derivatives are different. *First,* contrary to Nance *et al.* (1993), the observed negative coefficient estimate on deferred taxes implies that in highly corrupt countries, the more progressive marginal tax rates are, the less the firms are induced to use derivatives. *Second,* the market to book ratio has a highly significant and negative effect on firms' likelihood of using derivatives in highly corrupt countries but an insignificant effect in countries with low corruption. This result suggests that firms in highly corrupt countries do not use derivatives to reduce agency costs of debt. Meanwhile, firms with growth opportunities in countries with low corruption may have greater sufficient funds and/or higher external financing availability and thus have less incentive to use derivatives to deal with the mismatch between domestic costs and foreign revenues, as shown in Géczy *et al.* (1997). *Third,* the observed insignificant coefficient estimates on all proxies for exposure indicate that firms in highly corrupt countries do not use derivatives to eliminate exposure to financial risks. They use derivatives for other purposes, such as speculation or self-management purposes.

4.5.3. Multivariate analysis: Determinants of the intensity of derivatives use

4.5.3.1. Pooled Tobit estimations

Consistent with Hypothesis 1, the corruption index has a significant and positive impact on the intensity of derivatives use. We also observe a positive effect for government effectiveness. Taken together, these results suggest that good institutions with strong legal enforceability and governance capabilities lower hedging costs, hence facilitating firms' use of derivatives. Meanwhile, firms in countries with high corruption have less motivation to use derivatives, because entering into contracts is more costly due to bribes and other administrative payments.

Next, given that formal institutions are shaped by national cultural values (Li *et al.*, 2013), we can also explore the interaction effect of formal institutions and culture on derivatives use. The results suggest that firms' decisions on the extent of derivatives use may rely on the national cultural values of firms' country of origin. In particular, based on Licht *et al.*'s (2005) argument, the countries with high corruption levels in our sample are harmonious societies, as they emphasize accepting the status quo, avoiding conflicts, and self-assertion; hence, they are less comfortable with market-based financial systems. By contrast, the countries with low corruption levels are disharmonious societies that emphasize self-interested competition, requiring formal institutions to protect the rights of competing parties, so they are supportive of market-based financial systems that facilitate the use of derivatives contracts.

(INSERT TABLE 4.6 HERE)

Regarding types of derivatives, we find that besides the similar results to those in the case of any derivatives, the effects of some factors vary across types of derivatives. For interest rate derivatives, we observe that corruption is a significant determinant influencing firms' extent of using derivatives, while we do not find any significant effect of government effectiveness or

country risk on firms' level of derivatives use. For commodity price derivatives, we find that there is a strong relation between a country's corruption level and risks and a firms' decision on the extent of derivatives use. This result is different from the findings of previous studies that firms use commodity price derivatives for other reasons arising from industry-specific factors.

4.5.3.2. Moderating effect of corruption levels

When the corruption level is low, consistent with the findings from probit estimations, Table 4.7 shows that although some firm-specific factors are statistically significant determinants of firms' level of derivatives use, they do not support any traditional hedging theories, as most of the significant results are counter to predictions. In particular, the results do not support the hypothesis of economies of scale, as evidenced by the insignificant coefficient estimate on firm size. We are also unable to find any supporting evidence in favor of the corporate tax hypothesis or the argument of agency costs of debt. On the other hand, even though leverage and interest coverage are statistically significant, they are both opposite to the predicted sign.

(INSERT TABLE 4.7 HERE)

We observe that governance mechanism quality is a consistently important factor influencing non-financial firms' level of derivatives use, as government effectiveness is statistically different from zero and positively associated with firms' level of derivatives use in all models. On the other hand, we find the interesting result that non-financial firms in countries with low corruption consider countries' risk levels when they make decisions on the extent of derivatives use. This finding is consistent with our prior finding from the probit model in the previous section.

We note that the factors affecting firms' derivatives use in countries with low corruption and countries with high corruption differ somewhat. First, firm size is a significant determinant of

derivatives use by firms located in highly corrupt countries, as evidenced by the negative and significant coefficient estimates. In line with Clark and Judge (2008), we propose a possible explanation that in highly corrupt countries, small firms face greater information asymmetries and higher financing transaction costs, which is likely to make external financing more expensive for smaller firms and thus motivate them to use higher levels of derivatives.

Second, the coefficient estimates on current ratio and convertible debts are statistically different from zero and negatively related to firms' derivatives use decisions, while these variables are insignificant factors for firms located in countries with low corruption. According to Nance *et al.*'s (1993) argument on substitutes for hedging with derivatives, these results suggest that firms in highly corrupt countries possess liquid assets or issue debt instruments to mitigate the probability of financial distress and agency costs of debt with respect to long-term financing, which acts as a substitute to hedging with derivatives. This finding also supports Hypothesis 1 that firms have less incentive to enter into derivatives contracts if they are located in highly corrupt countries. Meanwhile, the countries with low corruption facilitate the use of derivatives, so firms based in these countries are not induced to use liquid assets and debt instruments as substitutes for derivatives.

Third, overall risk rating has a highly significant and positive effect on firms' likelihood of using derivatives, while it is an insignificant determinant of derivatives use by firms located in countries with low corruption. This result supports Hypothesis 3 and suggests that firms in highly corrupt countries use derivatives more aggressively, simply because their countries have higher degree of economic, financial, and political risks.

4.5.3.3. Extended multivariate regressions

To address the endogeneity problem, in this section, we implement lagged variables in a panel data framework with respect to corruption levels. This method not only offers a solution to the endogeneity issue but also enables us to control for unobserved heterogeneity, which is unchanged over time and correlates to the independent variables (see Chen and King, 2014).

(INSERT TABLE 4.8 HERE)

We find that firms in countries with low corruption levels use derivatives to hedge exposure, while firms located in highly corrupt countries use derivatives for selective hedging and not for the reasons stated by traditional hedging theories. In particular, we observe that the amount of derivatives use in the previous year is positively related to decisions on levels of derivatives use in the current year by firms in countries with low corruption, while it does not affect decisions of firms in countries with high corruption levels. This result suggests that firms located in countries with low corruption use derivatives as their norm. In contrast, in highly corrupt countries, firms "take their view" on decisions on the extent of derivatives use or, in Júnior's (2013) words, they selectively hedge. This result is similar to Allayannis *et al.*'s (2003) finding that non-financial firms in East Asian countries engage in selective hedging.

On the other hand, we find no relation between the extent of derivatives usage and the likelihood of firms in highly corrupt countries to use derivatives to reduce costs of bankruptcy and financial distress, agency costs of debt, economies of scale, or corporate tax burden. However, we observe that firms located in countries with low corruption levels use derivatives to reduce expected tax liability, thus reducing the volatility of pre-tax firm value, as evidenced by the significant and positive estimated coefficients on both tax rate and deferred taxes, which is consistent with Nance *et al.* (1993) and Kumar and Rabinovitch (2013). We also find that foreign

assets to total assets has a strongly significant and positive effect on decisions on the extent of derivatives use by firms in countries with low corruption, indicating that firms use derivatives to hedge, while all proxies for exposure are insignificant in the case of high corruption levels.

4.5.4. Robustness tests

4.5.4.1. Country random effects

The first robustness test we undertake is the country-random-effects specification with the Tobit model. With this approach, any remaining unobserved country effects are considered generated by some common mechanism and thereby able to transfer between countries (see Bryan and Jenkins, 2013).

(INSERT TABLE 4.9 HERE)

We find that firms are more likely to use higher levels of derivatives when they are located in countries with higher governance quality, more effective legal systems, and lower corruption, as shown by the positive and statistically significant coefficient on corruption and government effectiveness. Consistent with our previous findings, Table 4.9 also shows that non-financial East Asian firms do not use derivatives to eliminate exposure or for reasons established by hedging theories to overcome market imperfections, because with the exception of firm size, all observed estimated coefficients on firm-specific factors and exposure are insignificant.

4.5.4.2. Strength of governance mechanisms

Finally, we replicate the pooled probit and pooled Tobit with corruption and government effectiveness as a proxy for the strength of governance mechanisms to investigate the impact of cross-country governance mechanisms on the use of derivatives. Higher values of these indices correspond to stronger governance mechanisms. We also generate interaction terms between

proxies for exposure and those indices. Lel (2012) indicates that the main advantage of using country-specific indices is that regression estimates will be less subject to the endogeneity problem, because they are beyond firms' control and hence they cannot be jointly determined with firms' derivatives usage and other financial policies.

(INSERT TABLE 4.10 HERE)

We observe that the estimated coefficient on the interest coverage ratio is positive and statistically different from zero, and the coefficient on the interaction term between this variable and governance is also positive and significant (0.0212 and 0.0125, respectively). These results indicate that firms located in well-governed countries use derivatives more aggressively when they have higher exposure to interest rate risks. These findings also show that firms in countries with higher governance quality use derivatives more to reduce their costs of bankruptcy and financial distress, in line with the prediction of Smith and Stulz (1985) and existing literature such as Chen and King (2014) and Bartram *et al.* (2009). Therefore, firms in countries with strong governance mechanisms use derivatives to a greater extent to eliminate exposure and to overcome market imperfections as hedging theories argue. These results are consistent with our previous findings.

We obtain similar results regarding the impact of government effectiveness on derivatives use. We find that firms located in countries with better governance are more likely to use derivatives. These firms use derivatives to mitigate their bankruptcy costs and costs of financial distress, as evidenced by the significant and positive effect for leverage and for the interaction term between this variable and governance (0.0143 and 0.0894, respectively).

Taken together, the results in this section indicate that our main inferences are mostly robust to various estimation techniques and measures of the strength of governance mechanisms.

4.6. Conclusion

We explored the link between countries' governance quality and derivatives use by non-financial firms in eight countries in East Asia during the period of 2003–2013. Our findings strongly suggest that countries' governance mechanisms have significant and positive effect on firms' decisions on derivatives usage. Corruption level plays a significant role in explaining the use of derivatives. Firms in highly corrupt countries have less incentive to use derivatives, while firms located in countries with lower corruption levels are more motivated to use derivatives and use derivatives with a greater intensity. We conjecture that firms in well-governed countries use derivatives to hedge exposure and overcome their costs arising from market imperfections, whereas firms located in weakly governed countries use derivatives for speculation and/or selective hedging. Characteristics of governance mechanism in our sample East Asian countries could be found in other developed and developing countries, so these findings of this study may act as a baseline from which to generalize.

The theoretical contribution of this study is its specific operationalization and utilization of the institutional theory (e.g., North, 1990, 1994; Dunning, 2003; Peng, Lee, and Wang, 2005) and Dunning's OLI paradigm (Dunning, 1988; Dunning and Lundan, 2008) in non-financial firms' derivative activities. This approach contrasts sharply to the hedging theory, which focuses mainly on how firm-specific characteristics determine firms' hedging decision. Bartram *et al.* (2009) critically question the power of firm-specific factors, as they do not match the theoretical arguments that it has advanced. On the contrary, this study considers country-level factor deployment, utilization and exploitation with a focus on substantive elements underlying governance quality, which are the driver to rule a firm's performance and behavior. As such, our study contributes to the literature on the determinants of firms' derivatives use by underlining the

importance of incorporating country-level factors to explore incentives for derivatives use by non-financial firms. It suggests that country-specific characteristics may explain some of the ambiguity in the existing empirical literature. The strong link between institutional factors and the use of derivatives also stimulates further theoretical and empirical research aimed at elucidating firms' decisions on using derivatives.

Finally, our findings provide important policy implications emphasizing the role of policymakers in institutional development—such as enhancing legal systems, cracking down on corruption, and improving government efficiency—to enable firms to explore the benefits of using derivatives in managing risks.

Table 4.1: Summary statistics of derivatives use of the sample firms

This table shows the number of firms and the percentage of firms that use derivatives by country, and by year for all firms. We present the percentage of firms using derivatives separately for foreign currency derivatives, interest rate derivatives and commodity price derivatives. Panel A presents the uses of three types of derivatives based on firm-year observations by country. Panel B shows the trend of derivatives use over time.

Panel A: Derivatives use by country

Countries	**Total**	**Any derivatives**		**Foreign currency derivatives**		**Interest rate derivatives**		**Commodity price derivatives**	
	N	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
Indonesia	429	158	36.83	122	28.44	111	25.87	31	7.23
Philippines	352	352	100.00	139	39.49	99	28.12	57	16.24
Singapore	1639	651	39.72	735	44.98	434	26.58	168	10.29
Japan	1661	1661	100.00	1293	78.22	1020	61.71	233	14.10
Hong Kong	1606	382	23.79	350	21.88	265	16.56	95	5.94
Malaysia	1760	669	38.01	661	37.58	219	12.46	112	6.38
China	1111	179	16.11	202	18.20	100	9.01	88	7.93
Thailand	1133	1133	100.00	613	54.10	247	21.84	84	7.43
Total	9691	5185	53.50	4115	42.55	2495	25.81	868	8.99

Panel B: Derivatives use by year

Years	**Total**	**Any derivatives**		**Foreign currency derivatives**		**Interest rate derivatives**		**Commodity price derivatives**	
	N	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
2003-2006	3524	1752	49.72	1293	36.71	782	22.20	217	6.16
2007-2008	881	477	54.14	387	43.98	225	25.57	79	9.00
2009-2013	4405	2462	55.89	2021	46.06	1261	28.77	488	11.14
Total	9691	5185	53.50	4115	42.55	2495	25.81	868	8.99

Table 4.2: Definitions of independent variables

This table defines the firm-secific and country-specific independent variables, and control variables that we examine

Variables	Definitions	Sources
Panel A: Firm-specific variables		
Leverage	Total debt to total assets	Datastream
Interest coverage ratio	Earnings before interest and taxes (EBIT) to total interest expenses	Datastream
Deferred taxes	Deferred taxes represent the accumulation of taxes which are deferred as a result of timing differences between reporting sales and expenses for tax and financial reporting purposes	Datastream
Tax rate	Income taxes to pre-tax income	Datastream
Market to book value	Market value of a firm's common equity divided by book value of common equity	Datastream
Current ratio	Short term assets to short term liabilities	Datastream
Firm size	Natural logarithm of market value of total assets scaled by Producer price index (PPI)	Datastream
Convertible debt	Book value of convertible debt divided by firm size	Datastream
Preferred stock	Book value of preferred stock divided by firm size	Datastream
Dividend payout	Dividends per share to earnings per share	Datastream
Panel B: Country-specific variables		
Overall risk rating	Average scores for sovereign risk, currency risk, banking sector risk, and economic structure risk of each country on a from 0 (minimum risk) to 100 (maximum risk)	Economist Intelligence Unit
Corruption Perception Index (CPI)	Inverse ranking of country corruption levels on a scale from 100 (very clean) to 0 (highly corrupt)	Transparency International
Regulatory quality	Index measuring the governmental ability to formulate and implement sound policies and regulations with values from -2.5 (weak) to 2.5 (strong)	World Bank
Government effectiveness	Index measuring the quality of public services, civil service and the degree of its independence from political pressures, and the credibility of the government's commitment to such policies with values from -2.5 (weak) to 2.5 (strong)	World Bank
Panel C: Control variables		
FORSALES	Foreign sales to total sales	Datastream
FORASSETS	Foreign assets to total assets	Datastream
GDP per capita	Natural logarithm of GDP per capita of respective countries, measured in thousands of USD	World Bank
DEPOSITSTOGDP	Financial system deposits to GDP: The demand, time, saving deposits in deposit money banks and other financial institutions as a share of GDP	World Bank

Table 4.3: Summary statistics of firm-specific and country-specific characteristics

This table provides summary statistics for both firm-specific and country-specific characteristics of the sample firms, partitioned on the basis of derivatives use. It reports summary statistics for proxies associated to incentives for using derivatives for firms that use either foreign currency derivatives, interest rate derivatives or commodity price derivatives (derivative users) and firms that do not (derivatives non-users). P-values for testing the difference in mean are also reported. Data is measured in thousands of USD, and as of fiscal year-ends.

Variables	Foreign currency derivatives					Interest rate derivatives					Commodity price derivatives				
	Users		Non-users		*p*-value	Users		Non-users		*p*-value	Users		Non-users		*p*-value
	Mean	Std.Dev	Mean	Std.Dev		Mean	Std.Dev	Mean	Std.Dev		Mean	Std.Dev	Mean	Std.Dev	
Firm-specific variables															
Leverage	23.76	33.63	25.54	95.88	0.203	23.95	29.57	25.07	86.39	0.341	22.53	27.35	25.01	79.13	0.049
Interest coverage	2931.9	103942	116.6	31358.6	0.281	3219	128080	1429	35604	0.494	1822	37022	1898	74477	0.959
Deferred taxes	-44679	858534	4259	425653	0.000	-56623	104288	-2625	429692	0.013	-38137	818757	-14462	62759	0.412
Tax rate	38.83	419.24	28.01	141.04	0.148	35.29	107.02	31.91	344.25	0.513	32.29	128.29	32.91	311.01	0.921
Market to book value	2.699	46.09	2.84	56.72	0.892	1.528	21.74	3.22	59.55	0.043	5.24	99.87	2.539	45.17	0.435
Current ratio	4.076	65.35	3.549	32.83	0.638	3.83	48.93	3.756	49.59	0.950	5.385	53.42	3.615	49.02	0.353
Firm size	6.434	2.47	5.476	2.19	0.000	6.81	2.46	5.56	2.24	0.000	6.198	2.42	5.855	2.36	0.000
Convertible debt	0.0014	0.0127	0.002	0.019	0.027	0.0014	0.0137	0.002	0.017	0.076	0.001	0.011	0.0019	0.0172	0.092
Preferred stock	0.0018	0.0192	0.007	0.271	0.112	0.0018	0.0198	0.006	0.2389	0.113	0.0018	0.02	0.0055	0.216	0.128
Dividend payout	27.58	24.36	24.61	25.78	0.000	27.078	23.74	25.45	25.72	0.007	26.358	24.51	25.813	25.29	0.557
Country-specific variables															
Overall risk rating	29.63	7.774	31.37	8.379	0.000	28.68	7.93	31.30	8.15	0.000	30.11	8.216	30.68	8.167	0.049
Corruption index	62.36	19.21	58.42	19.54	0.000	65.49	18.39	58.23	19.52	0.000	62.11	19.64	59.90	19.47	0.001
Regulatory quality	0.94	0.71	0.87	0.89	0.000	1.02	0.71	0.86	0.85	0.000	0.91	0.79	0.89	0.82	0.618
Government effectiveness	1.21	0.72	1.08	0.83	0.000	1.27	0.73	1.08	0.81	0.000	1.17	0.8	1.13	0.79	0.161
Control variables															
FORSALES	37.08	33.86	35.99	38.15	0.220	39.40	33.61	35.40	37.09	0.000	39.65	40.23	36.18	35.76	0.042
FORASSETS	21.32	24.99	24.37	28.93	0.000	22.33	23.98	23.28	28.43	0.215	22.82	25.63	23.04	27.46	0.848
GDP per capita	36015	22265	34965	24087	0.026	37863	21545	34563	23866	0.000	36256	23672	36330	23299	0.2711
DEPOSITSTOGDP	146.30	67.98	136.03	86.014	0.000	158.16	72.069	134.2	80.39	0.000	142.42	76.09	140.2	79.31	0.4179

Table 4.4: Probit regression estimates of the likelihood of using derivatives

This table reports the regression for the probability of using any type of derivatives, foreign currency, interest rate, and commodity price derivatives. The dependent variable is binary variable, which take on a value of 1 if firm use derivative, and 0 otherwise. All independent variables definitions are reported in Table 4.2.The coefficients and significance levels are reported on each model. Standard errors are clustered by country to control for heteroscedasticity and serial correlation. Model 1 investigates the country-specific characteristics only; both firm-specific and country-specific variables are included in the Model 2. Asterisks ***, **, and *indicate significance at the 1%, 5% and 10% level, respectively; *p*-values are in parentheses

Explanatory variables	Any derivatives		Foreign currency derivatives		Interest rate derivatives		Commodity price derivatives	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Country- specific factors								
Corruption	0.105***	0.0939***	0.0979***	0.0855***	0.109***	0.0972***	0.0416***	0.0366***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.005)
Government effectiveness	0.651	0.503*	0.644*	0.496*	0.0838	-0.0402	-0.296	-0.246
	(0.308)	(0.084)	(0.076)	(0.083)	(0.814)	(0.919)	(0.252)	(0.420)
Overall risk rating	0.132*	0.111*	0.126*	0.105*	0.105**	0.0923**	0.0367	0.0337
	(0.077)	(0.100)	(0.071)	(0.085)	(0.015)	(0.017)	(0.265)	(0.326)
Firm- specific factors								
Firm size		0.0436***		0.0449***		0.0409*		0.0142
		(0.000)		(0.000)		(0.057)		(0.403)
Leverage		0.0197**		0.0252***		0.0347***		-0.0333
		(0.021)		(0.000)		(0.005)		(0.829)
Interest coverage		0.0521		0.0295**		-0.0700		0.0132
		(0.133)		(0.021)		(0.339)		(0.164)
Tax rate		-0.0247***		-0.0268**		-0.0537		-0.0213
		(0.007)		(0.021)		(0.645)		(0.378)
Deferred taxes		-0.0283*		-0.0577***		0.0512***		0.0493***
		(0.079)		(0.000)		(0.007)		(0.000)
Market to book value		-0.0106***		-0.0117***		-0.0127*		-0.0961**
		(0.000)		(0.002)		(0.075)		(0.027)
Current ratio		-0.0737		-0.0762		-0.0667		-0.0129
		(0.347)		(0.352)		(0.441)		(0.338)
Dividend payout		-0.0694		-0.0953		-0.0222		0.0485
		(0.204)		(0.467)		(0.011)		(0.799)
Control variables								
FORSALES	0.0757	0.0125	0.0108	0.0174	0.0203*	0.0256**	0.0139	0.0939
	(0.640)	(0.399)	(0.559)	(0.335)	(0.082)	(0.040)	(0.336)	(0.593)
FORASSETS	-0.0326	-0.0302	-0.0280	-0.0248	-0.0210	-0.0212	-0.0192	-0.0256
	(0.163)	(0.265)	(0.262)	(0.364)	(0.308)	(0.330)	(0.204)	(0.273)
GDP per capita	0.0616***	0.0530***	0.0591**	0.0496***	0.0530***	0.0430***	0.0107	-0.0889
	(0.001)	(0.003)	(0.001)	(0.004)	(0.000)	(0.000)	(0.115)	(0.344)
DEPOSITSTOGDP	0.253	0.436*	0.931	0.066	0.328	0.755	0.587	0.606
	(0.117)	(0.093)	(0.227)	(0.228)	(0.734)	(0.406)	(0.422)	(0.412)
Intercept	-8.927**	-7.627**	-8.561**	-7.271**	-8.984***	-7.962***	-4.520***	-4.225**
	(0.018)	(0.027)	(0.017)	(0.024)	(0.000)	(0.000)	(0.007)	(0.021)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No of observations	3672	2686	3671	2679	3663	2680	3644	2661
Adjusted R-squared	0.1356	0.1776	0.1301	0.1675	0.1361	0.1775	0.0551	0.0797

Table 4.5: Probit estimations for determinants of derivative use based on corruption levels

This table presents regressions from pooled probit models of the likelihood of using derivatives on the basis of corruption levels: low corruption, and high corruption. We define corruption levels based on corruption index, in which those countries having scores greater than 75 are grouped into low corruption level, and those countries having scores less than 75 are considered to be highly corrupt. The dependent variable is binary variable, which take on a value of 1 if firm uses derivative, and 0 otherwise. All independent variables definitions are reported in Table 4.2. The coefficients and significance levels are reported on each model. Standard errors are clustered by country to control for heteroscedasticity and serial correlation. Asterisks ***, **, and * indicate significance at the 1%, 5% and 10% level, respectively; *p*-values are in parentheses

Explanatory variables	**Any derivatives**		**Foreign currency derivatives**		**Interest rate derivatives**		**Commodity price derivatives**	
	Low corruption	**High corruption**	**Low corruption**	**High corruption**	**Low corruption**	**High corruption**	**Low corruption**	**High corruption**
Country-specific factors								
Government effectiveness	0.598***	0.819***	1.368***	0.525*	0.773***	1.570***	1.329**	0.970**
	(0.006)	(0.006)	(0.001)	(0.039)	(0.001)	(0.000)	(0.028)	(0.028)
Overall risk rating	-0.0638	0.0435	-0.281	0.0557	0.0656	0.00616	0.0556	-0.0173
	(0.838)	(0.389)	(0.421)	(0.294)	(0.810)	(0.841)	(0.674)	(0.709)
Firm-specific factors								
Firm size	0.0327***	0.0297**	0.0414***	0.0283*	0.0500	0.0396	-0.0353	0.0262
	(0.000)	(0.027)	(0.002)	(0.060)	(0.239)	(0.113)	(0.389)	(0.183)
Leverage	0.0194***	0.0114	0.0274***	0.0167	0.0363***	0.0204	-0.0417***	0.0109
	(0.005)	(0.538)	(0.000)	(0.169)	(0.000)	(0.235)	(0.005)	(0.433)
Interest coverage	0.0192	0.0438	0.0674*	0.0287	-0.0751***	-0.0116	0.0326***	-0.0225
	(0.124)	(0.208)	(0.094)	(0.290)	(0.001)	(0.462)	(0.000)	(0.388)
Tax rate	-0.0303*	0.0350	-0.0313**	-0.0759	-0.0249	0.0474***	-0.0439***	0.0142
	(0.085)	(0.813)	(0.003)	(0.513)	(0.363)	(0.000)	(0.006)	(0.307)
Deferred taxes	0.0063	-0.0358***	0.0216	-0.0594***	0.0209	0.0592***	0.0534***	0.0384***
	(0.919)	(0.000)	(0.698)	(0.000)	(0.287)	(0.000)	(0.000)	(0.000)
Market to book value	-0.00863	-0.0084**	-0.0169**	-0.0056	0.0113	-0.0411***	-0.0039	-0.0179
	(0.279)	(0.023)	(0.041)	(0.203)	(0.721)	(0.007)	(0.110)	(0.453)
Control variables								
FORSALES	0.0117**	0.0474***	0.0103	0.0610***	0.0828***	0.0527***	-0.0214*	0.0344
	(0.020)	(0.000)	(0.108)	(0.000)	(0.001)	(0.001)	(0.087)	(0.201)
FORASSETS	-0.0348	0.0310	-0.0015	0.0240	-0.0297	0.0106	-0.0614***	0.0152
	(0.209)	(0.160)	(0.540)	(0.431)	(0.370)	(0.102)	(0.000)	(0.711)
GDP per capita	0.0400***	0.0127***	0.0547***	0.0114***	0.0330***	0.0132***	0.0356***	0.0485**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.004)	(0.011)
DEPOSITSTOGDP	0.349	0.932***	0.898	0.826***	0.159**	0.994***	0.257	-0.296
	(0.295)	(0.001)	(0.457)	(0.000)	(0.006)	(0.000)	(0.177)	(0.608)
Intercept	0.170	-3.502	5.295	-3.869	-2.843	-2.809**	-2.169	-1.389
	(0.981)	(0.131)	(0.512)	(0.123)	(0.676)	(0.047)	(0.467)	(0.500)
Other firm-specific factors	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No of observations	927	1757	927	1750	927	1748	822	1733
Adjusted R-squared	0.0873	0.1880	0.0933	0.1654	0.0933	0.2001	0.0942	0.0854

Table 4.6: Tobit estimates for the extent of the use of derivatives

This table reports the pooled tobit regressions with censoring at zero and one for the extent of firms' using any type of derivatives, foreign currency, interest rate, and commodity price derivatives. The dependent variable is continuous variable, which is measured as notional amount of derivatives use divided by total assets. Non-derivative users are set to zero. All independent variables definitions are reported in Table 4.2. The coefficients and significance levels are reported on each model. Standard errors are clustered by country to control for heteroscedasticity and serial correlation. Model 1 investigates the country-specific characteristics only; both firm-specific and country-specific variables are included in the Model 2. Asterisks ***, **, and * indicate significance at the 1%, 5% and 10% level, respectively; *p*-values are in parentheses

Explanatory variables	Any derivatives		Foreign currency derivatives		Interest rate derivatives		Commodity price derivatives	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Country-specific factors								
Corruption	0.0267	0.0585*	0.0304*	0.0467*	0.0143**	0.0136**	0.0102**	0.0675**
	(0.245)	(0.054)	(0.062)	(0.086)	(0.030)	(0.045)	(0.049)	(0.047)
Government effectiveness	0.204***	0.0329*	0.0447*	-0.0350	-0.234	-0.223	-0.0598	-0.0699
	(0.000)	(0.071)	(0.073)	(0.728)	(0.146)	(0.245)	(0.467)	(0.903)
Overall risk rating	0.0204***	0.0108	0.0864	0.0457	0.0678	0.0195	0.0120*	0.0972
	(0.010)	(0.128)	(0.198)	(0.508)	(0.935)	(0.842)	(0.090)	(0.122)
Control variables								
FORSALES	0.0673	0.0459	0.0545	0.0394	0.0722	0.0465	0.0955	0.0559
	(0.280)	(0.260)	(0.377)	(0.305)	(0.228)	(0.196)	(0.217)	(0.472)
FORASSETS	-0.0117*	-0.0775	-0.0758	-0.0404	-0.0154*	-0.0915	-0.0155	-0.0182
	(0.061)	(0.212)	(0.168)	(0.442)	(0.082)	(0.199)	(0.140)	(0.184)
GDP per capita	0.0363	0.0301	0.0223	0.0191	0.0196	0.0198	0.0170	0.0191
	(0.331)	(0.375)	(0.588)	(0.588)	(0.643)	(0.555)	(0.360)	(0.233)
DEPOSITSTOGDP	0.281*	0.269*	0.276†	0.279*	0.121	0.237	0.282	0.254
	(0.094)	(0.086)	(0.073)	(0.091)	(0.639)	(0.423)	(0.537)	(0.473)
Intercept	-0.729	-0.419	-0.428	-0.281	-0.924	-0.738	-2.054**	-1.657**
	(0.221)	(0.369)	(0.477)	(0.549)	(0.224)	(0.185)	(0.014)	(0.022)
Firm-specific factors	No	Yes	No	Yes	No	Yes	No	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No of observations	3471	2540	3676	2691	3422	2486	3595	2627
Adjusted R-squared	0.071	0.112	0.091	0.1406	0.073	0.1066	0.0664	0.1291

Table 4.7: Tobit estimates for the extent of derivative use based on corruption levels

This table reports the pooled tobit regressions with censoring at zero and one for the extent of firms' using derivatives on the basis of corruption levels: low corruption, and high corruption level. We define corruption levels based on corruption index, in which those countries having scores greater than 75 are grouped into low corruption level, and those countries having scores less than 75 are considered to be highly corrupt. The dependent variable is continuous variable, which is measured as notional amount of derivatives use divided by total assets. Non-derivative users are set to zero. All independent variables definitions are reported in Table 4.2. The coefficients and significance levels are reported on each model. Standard errors are clustered by country to control for heteroscedasticity and serial correlation. Asterisks ***, **, and * indicate significance at the 1%, 5% and 10% level, respectively; *p*-values are in parentheses

Explanatory variables	**Any derivatives**		**Foreign currency derivatives**		**Interest rate derivatives**		**Commodity price derivatives**	
	Low corruption	**High corruption**	**Low corruption**	**High corruption**	**Low corruption**	**High corruption**	**Low corruption**	**High corruption**
Country-specific factors								
Government effectiveness	18.97***	0.389**	17.34***	0.335	26.29***	0.542***	4.450***	0.0903
	(0.000)	(0.068)	(0.000)	(0.128)	(0.000)	(0.000)	(0.000)	(0.608)
Overall risk rating	0.924	-0.0437**	-0.582	-0.0409**	0.712	-0.0491***	0.321	-0.00842
	(0.491)	(0.006)	(0.181)	(0.013)	(0.463)	(0.000)	(0.324)	(0.554)
Firm-specific factors								
Firm size	-0.871	-0.0268***	-0.482	-0.0598***	-0.0780	-0.0963	-0.0583	-0.0226
	(0.134)	(0.000)	(0.136)	(0.000)	(0.935)	(0.911)	(0.808)	(0.555)
Leverage	-0.0491*	-0.0454	-0.0464	0.0850	-0.0127	-0.0432	-0.0238	-0.0195
	(0.030)	(0.735)	(0.622)	(0.923)	(0.869)	(0.602)	(0.239)	(0.415)
Interest coverage	0.0174***	-0.0129	0.0138***	0.0991	-0.0597***	-0.0127*	0.0455***	-0.0374
	(0.000)	(0.974)	(0.000)	(0.725)	(0.000)	(0.083)	(0.005)	(0.444)
Tax rate	-0.0101	0.0126**	-0.0600***	0.0851*	-0.0531	0.0226***	-0.0101	0.0582
	(0.564)	(0.011)	(0.000)	(0.054)	(0.492)	(0.000)	(0.231)	(0.318)
Deferred taxes	0.0640*	-0.0235	0.0531*	-0.0503	0.0821	0.0353	0.0103	0.0149
	(0.085)	(0.969)	(0.089)	(0.311)	(0.183)	(0.556)	(0.286)	(0.313)
Market to book value	-0.121	-0.0917	-0.138***	0.0109	-0.0319	-0.0817**	-0.0622	-0.0198
	(0.165)	(0.786)	(0.000)	(0.968)	(0.743)	(0.026)	(0.324)	(0.371)
Current ratio	-0.145	-0.0260*	-0.197	-0.0514***	-0.0247	0.0160	-0.299***	0.0303
	(0.779)	(0.087)	(0.264)	(0.000)	(0.958)	(0.888)	(0.000)	(0.973)
Dividend payout	0.0458	-0.0201**	0.0351***	-0.0266***	-0.0656	-0.0707*	-0.0460	0.0201
	(0.861)	(0.041)	(0.000)	(0.001)	(0.005)	(0.097)	(0.651)	(0.655)
Convertible debt	2.176	-6.063***	-7.059	-5.734***	-23.11***	-3.470	-25.27***	-4.444*
	(0.902)	(0.002)	(0.548)	(0.001)	(0.000)	(0.213)	(0.000)	(0.062)
Control variables								
FORSALES	0.0183	0.0317***	0.0754	0.0278***	0.0105	0.0143***	-0.0125***	0.0126*
	(0.239)	(0.000)	(0.572)	(0.000)	(0.154)	(0.001)	(0.005)	(0.070)
FORASSETS	-0.0257	0.0181	-0.0171	0.0133	-0.0131	0.0551	-0.0360***	0.0306
	(0.539)	(0.434)	(0.387)	(0.491)	(0.717)	(0.518)	(0.000)	(0.690)
GDP per capita	0.342***	0.131***	0.811***	0.159***	0.416***	0.0496*	0.890***	0.0326
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.096)	(0.000)	(0.159)
DEPOSITSTOGDP	0.338	0.951***	0.525	0.965***	0.607	0.972*	0.370	-0.0209
	(0.620)	(0.000)	(0.808)	(0.000)	(0.899)	(0.092)	(0.229)	(0.909)
Intercept	133.9***	-0.369	128.8***	-0.905	142.6***	1.011*	-32.77***	-0.446
	(0.000)	(0.569)	(0.000)	(0.175)	(0.000)	(0.053)	(0.000)	(0.104)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No of observations	804	1669	907	1716	848	1578	887	1675
Adjusted R-squared	0.0220	0.0411	0.0303	0.0484	0.0132	0.152	0.0953	0.1842

Table 4.8: Results of Panel data regression with lagged variables based on corruption levels

This table presents Panel data regressions with one-year lagged measure of all explanatory variables and one-year lagged derivatives use lagged variables based on corruption levels. We define corruption levels based on corruption index, in which those countries having scores greater than 75 are grouped into low corruption level, and those countries having scores less than 75 are considered to be highly corrupt. The dependent variable is continuous variable, which is measured as notional amount of derivatives use divided by total assets. Non-derivative users are set to zero. All independent variables definitions are reported in Table 4.2. The coefficients and significance levels are reported on each model. Standard errors are clustered by country to control for heteroscedasticity and serial correlation. Asterisks ***, **, and * indicate significance at the 1%, 5% and 10% level, respectively; *p*-values are in parentheses.

Explanatory variables	Any derivatives		Foreign currency derivatives		Interest rate derivatives		Commodity price derivatives	
	Low corruption	High corruption	Low corruption	High corruption	Low corruption	High corruption	Low corruption	High corruption
Lagged derivative use	0.292***	-0.0272	0.0576***	0.264	0.0597	0.0786***	0.527***	0.292***
	(0.000)	(0.881)	(0.000)	(0.201)	(0.908)	(0.000)	(0.002)	(0.000)
Country-specific factors								
Government effectiveness	1.112***	-0.225	7.439*	-0.116	0.0114***	0.166	-0.0712***	1.112***
	(0.008)	(0.453)	(0.051)	(0.336)	(0.005)	(0.504)	(0.000)	(0.008)
Overall risk rating	5.221***	0.0137**	2.440***	0.0779	0.0867	0.119***	0.0744	5.221***
	(0.001)	(0.048)	(0.000)	(0.136)	(0.312)	(0.000)	(0.616)	(0.001)
Control variables								
FORSALES	0.0205***	0.0363	0.0606**	0.0318*	-0.017	0.0303**	0.0233	0.0205***
	(0.000)	(0.737)	(0.031)	(0.062)	(0.605)	(0.037)	(0.843)	(0.000)
FORASSETS	0.0164***	0.0145	0.0124*	0.0524	0.0621**	0.0697***	0.0363	0.0164***
	(0.000)	(0.178)	(0.061)	(0.198)	(0.039)	(0.000)	(0.278)	(0.000)
GDP per capita	0.286	0.1837***	0.2513**	0.951*	0.0542	0.3271**	0.095	128.6
	(0.201)	(0.001)	(0.023)	(0.067)	(0.956)	(0.026)	(0.666)	(0.201)
DEPOSITSTOGDP	0.1069	0.588	0.5815***	0.343***	0.257	0.671***	0.096***	10.69
	(0.516)	(0.213)	(0.000)	(0.008)	(0.381)	(0.001)	(0.008)	(0.516)
Intercept	-26.503	1.275	-1.053	0.2440***	-0.826	1.002***	-2.973**	-0.0602
	(0.32)	(0.378)	(0.66)	(0.010)	(0.90)	(0.000)	(0.032)	(0.319)
Firm-level factors	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Current country-level factors	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No of observations	268	602	270	695	298	724	324	788
Adjusted R-squared	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 4.9: Random-effects Tobit model

This tables presents resutls from random-effects tobit. The dependent variable is continuous variable. All independent variables definitions are reported in Table 4.2. The coefficients and significance levels are reported on each model. Standard errors are clustered by country to control for heteroscedasticity and serial correlation. Asterisks ***, **, and * indicate significance at the 1%, 5% and 10% level, respectively; *p*-values are in parentheses

Explanatory variables	Any derivatives	Foreign currency derivatives	Interest rate derivatives	Commodity price derivatives
Country-specific factors				
Corruption	0.156***	0.0614	0.305***	0.00250
	(0.005)	(0.118)	(0.000)	(0.792)
Government effectiveness	1.734*	0.635	8.856***	0.0667
	(0.076)	(0.553)	(0.000)	(0.805)
Overall risk rating	0.0782	0.0242*	-0.278*	0.00597
	(0.536)	(0.086)	(0.060)	(0.831)
Control variables				
FORSALES	-0.0285	-0.0335	0.0277	-0.0267
	(0.708)	(0.534)	(0.754)	(0.622)
FORASSETS	-0.0288	-0.0111	0.0972	-0.0584
	(0.723)	(0.058)	(0.273)	(0.374)
GDP per capita	0.359	0.125	0.103	0.0437
	(0.296)	(0.597)	(0.792)	(0.238)
DEPOSITSTOGDP	0.606	0.910	0.451	0.0632
	(0.323)	(0.311)	(0.329)	(0.174)
Intercept	-10.19	-6.545	-8.848	-0.429
	(0.201)	(0.241)	(0.344)	(0.953)
Firm-specific factors	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
No of observations	2473	2623	2426	2562
Log likelihood	-5066.77	-4126.84	-7227.57	-2019.42

Table 4.10: Derivatives use and the strength of governance mechanism

This table reports pooled probit and pooled tobit estimates of the effects of the strength of governance mechanism on the use of any derivative. Higher values of these three country-specific indices refer to higher strength of governance mechanism. In probit models, the dependent variable is binary variable, which takes on a value of 1 if a firm uses derivative, and 0 otherwise. In Tobit models, the dependent variable is continuous variable, which is measured as notional amount of derivatives use divided by total assets; non-derivative users are set to zero. All independent variables definitions are reported in Table 4.2. The coefficients and significance levels are reported on each model. Standard errors are clustered by country to control for heteroscedasticity and serial correlation. Asterisks ***, **, and * indicate significance at the 1%, 5% and 10% level, respectively; *p*-values are in parentheses

Explanatory variables	**Corruption**		**Government effectiveness**	
	Probit	**Tobit**	**Probit**	**Tobit**
	(1)	**(2)**	**(3)**	**(4)**
Firm size	0.0393***	-0.0144**	0.123***	-0.0864
	(0.000)	(0.012)	(0.000)	(0.367)
Leverage	0.00650	0.00162	0.00352**	0.00143*
	(0.208)	(0.477)	(0.037)	(0.089)
Leverage*Governance	-0.0736	-0.0212	-0.0174	0.0894**
	(0.261)	(0.446)	(0.113)	(0.014)
Interest coverage	0.0106	0.0205*	0.0880	0.0312
	(0.117)	(0.064)	(0.130)	(0.115)
Interest coverage* Governance	-0.0112	0.0125*	-0.0402	-0.0114
	(0.216)	(0.076)	(0.171)	(0.135)
Overall risk rating	0.0802***	0.0131	-0.0440	0.0616
	(0.009)	(0.159)	(0.422)	(0.587)
FORSALES	0.0739*	0.0205	0.0351	0.0591
	(0.099)	(0.145)	(0.133)	(0.518)
FORSALES*Governance	-0.0942*	-0.0287	-0.0178	-0.0190
	(0.090)	(0.132)	(0.118)	(0.719)
FORASSETS	0.0615	0.0169	-0.0157	-0.0292
	(0.464)	(0.366)	(0.767)	(0.722)
FORASSETS*Governance	-0.0133	-0.0393	-0.0177	-0.0406
	(0.280)	(0.105)	(0.573)	(0.356)
Intercept	-6.581***	-0.922	1.401	-0.109
	(0.000)	(0.268)	(0.541)	(0.887)
Other firm-specific factors	Yes	Yes	Yes	Yes
Other control variables	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
No of observations	2686	2200	2686	2200

Appendix 4.1: Probit and Tobit regressions for domestic firms

This table reports the Probit and Tobit regression estimates for domestic firms with regard to for the use of any type of derivatives, foreign currency, interest rate, and commodity price derivatives. All independent variables definitions are reported in Table 4.2.The coefficients and significance levels are reported on each model. Standard errors are clustered by country to control for heteroscedasticity and serial correlation. Asterisks ***, **, and * indicate significance at the 1%, 5% and 10% level, respectively; *p*-values are in parentheses

Explanatory variables	Probit models				Tobit models			
	Any derivatives	**FC derivatives**	**IR derivatives**	**CD derivatives**	**Any derivatives**	**FC derivatives**	**IR derivatives**	**CD derivatives**
Country- specific factors								
Corruption	0.106***	0.115***	0.0947***	0.0956***	0.0525	0.0390	0.0117**	0.0103**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.196)	(0.333)	(0.044)	(0.049)
Government effectiveness	1.294	1.745*	0.215	0.585	0.144	0.0699	-0.230	0.175
	(0.186)	(0.072)	(0.733)	(0.284)	(0.412)	(0.684)	(0.307)	(0.306)
Overall risk rating	0.217**	0.257*	0.100	0.178***	0.0253*	0.0163	-0.0419	0.0376***
	(0.019)	(0.011)	(0.183)	(0.001)	(0.076)	(0.204)	(0.836)	(0.002)
Firm- specific factors								
Firm size	0.0574***	0.0716***	0.0563*	-0.0120	-0.0111	-0.0140	0.0147	-0.0322
	(0.009)	(0.000)	(0.090)	(0.968)	(0.487)	(0.898)	(0.318)	(0.781)
Leverage	0.0147	0.0597	0.0393	-0.0284	0.0474	0.0187	0.0769	-0.0881
	(0.921)	(0.724)	(0.141)	(0.867)	(0.555)	(0.718)	(0.450)	(0.925)
Interest coverage	0.0201***	0.0207*	-0.0115	-0.0482	0.0256**	0.0296***	-0.0664	-0.0164
	(0.009)	(0.001)	(0.371)	(0.390)	(0.042)	(0.006)	(0.334)	(0.257)
Tax rate	-0.0426**	-0.0608	-0.0279**	-0.0159	-0.0131*	-0.0108**	-0.0159	-0.0360
	(0.022)	(0.380)	(0.042)	(0.376)	(0.086)	(0.050)	(0.209)	(0.351)
Deferred taxes	-0.0123***	-0.0135***	0.057	0.0299	-0.0214*	-0.0258*	0.0354	-0.0557***
	(0.000)	(0.000)	(0.127)	(0.251)	(0.086)	(0.051)	(0.854)	(0.005)
Market to book value	-0.0105	-0.0164	-0.0162	-0.0313	-0.0253	-0.0476	-0.0974**	-0.0106
	(0.342)	(0.210)	(0.217)	(0.219)	(0.488)	(0.235)	(0.013)	(0.191)
Current ratio	-0.0049	0.0168	-0.0139	-0.0120	0.0508	0.0294	-0.0277	-0.0424
	(0.821)	(0.939)	(0.554)	(0.540)	(0.578)	(0.605)	(0.737)	(0.683)
Dividend payout	-0.0213	-0.0347*	-0.0732	0.0166	-0.0393	-0.0646*	-0.0717	0.0998
	(0.150)	(0.055)	(0.685)	(0.623)	(0.419)	(0.063)	(0.956)	(0.396)
Control variables								
FORSALES	0.0133	0.0411	-0.0281**	-0.0278	0.0146	-0.0578	-0.0998	-0.0708
	(0.940)	(0.841)	(0.027)	(0.425)	(0.811)	(0.930)	(0.364)	(0.630)
FORASSETS	-0.0309	-0.0228	-0.0956	-0.0290	-0.0662	-0.0408	0.0336	-0.0167
	(0.155)	(0.358)	(0.718)	(0.254)	(0.368)	(0.577)	(0.811)	(0.351)
GDP per capita	0.0612	0.0718***	0.0442***	0.0409**	0.0552	0.0468	0.0464	0.0295
	(0.005)	(0.003)	(0.001)	(0.010)	(0.317)	(0.397)	(0.478)	(0.631)
DEPOSITSTOGDP	0.644	0.229	0.165	0.394***	0.212	0.187	0.733	9.448***
	(0.393)	(0.795)	(0.800)	(0.000)	(0.370)	(0.376)	(0.122)	(0.001)
Intercept	-11.81	-14.00**	-7.950**	-11.36***	-0.598	-0.332	-0.280	-3.135**
	(0.009)	(0.006)	(0.026)	(0.000)	(0.370)	(0.587)	(0.745)	(0.025)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No of observations	1122	1120	1104	1033	1037	1126	1059	1095
Adjusted R-squared	0.1837	0.1963	0.2312	0.1906	0.1916	0.1842	0.1969	0.2638

CHAPTER 5

EMPIRICAL ANALYSIS OF RELATIONSHIP BETWEEN DERIVATIVES USE AND FIRM VALUE

5.1. Introduction

The Modigiliani and Miller (1958) theorem with perfect capital markets shows that risk management is irrelevant to firm value, thereby hedging with derivatives does not add value to a firm. However, numerous studies (e.g., Nance, Smith, and Smithson, 1993; Froot, Scharfstein, and Stein, 1993; Smith and Stulz, 1985; Mayer and Smith, 1990; Mayer and Smith, 1982; Bessembinder, 1991) suggest that the use of derivatives is a value-increasing strategy for a firm by reducing costs brought about market imperfections. A large part of empirical studies on this area have focused on the relation between derivatives use and firm characteristics to investigate hedging theory and explain why firms use derivatives. Only recently, there has been another strand of research explored the impacts of derivatives use on firm value.

Most of these studies have concentrated on unconditional effects of derivatives use on firm value (e.g., Allayannis and Weston, 2001; Guay and Kothari, 2003; Bartram, Brown, and Conrad, 2011). A few recent researchers have developed tests to investigate value implications of derivatives use conditional on corporate governance or agency problems (e.g., Fauver and Naranjo, 2010; Allayannis, Lel, and Miller, 2012). However, the existing literature provides inconsistent views about the effect of derivatives use on firm value. Therefore, the value effects of derivatives use remain an open question.

Filling this gap in the literature, we explore the unique value effect of derivatives use for a

sample of 881 non-financial firms in 8 East Asian countries over the period of 2003-2013 with new hand-collected dataset of derivatives use. We make the following contributions:

First, we focus on value implication of derivatives use under influence of corruption environment. Extant studies address the drivers of value implication focusing on the structural characteristics of firm-specific resources and capabilities. However, all firms are embedded in institutional environments, i.e., "rule of game" (North, 1990, 1994). A key factor in such environment is corruption. Despite the efforts of government, non-government and multilateral institutions to reduce corruption levels, corruption becomes a widespread phenomenon worldwide today and firms regularly engage in corrupt practices such as bribery (Beets, 2005). In East Asian countries, corruption is a serious problem. In 2013, 64% of these countries scored below 50 in perceived level of public corruption[11]. Also, while there are a great number of studies examining the correlation between corruption and economic growth, the effects of corruption on value effect of derivatives use is little known.

Theoretically, corruption on the one hand can act as a "grabbing hand" by increasing uncertainty and transaction costs (e.g., Bardhan, 1997; Quazi, 2014), which impedes firms' operations. On the other hand, corruption acts as a "helping hand" by greasing the wheels of commerce and raising economic growth in the presence of weak legal and regulatory frameworks (Bardhan, 1997; Houston, 2007), which should improve firms' performance. These contradicting effects may derive from the varying degree of ambiguity associated with corrupt transactions in different countries (Petrou, 2014). Thus, without directly taking into account corruption environment, it would be difficult to determine whether the use of derivatives is value-enhancing activity. Undertaking this research need, we raise important questions that have

[11] Transparency International. 2013, Corruption Perception Index

received little or no attention is: How does corruption influence value effect of derivatives use? In light of a corruption environment, whether the use of derivatives increases firm value?

Second, over the past two decades, scholars have examined and provided important insights into the effects of derivatives use on the value of non-financial firms. Yet important questions remain: In what type of firm is the effect greater (or less), and what factors determine this difference? In this study, we shed new light on this gap by examining how the value effects of derivatives use may vary across foreign-owned firms (i.e., foreign MNC affiliates) and domestic-owned firms in light of an environment of corruption. We break down the subset of domestic-owned firms into domestic firms and multinational corporations (henceforth MNCs). Although research in international business (IB) has long recognized that by virtue of multinationality, MNCs have distinctive advantages in business operations vis-à-vis domestic firms (e.g., Hymer, 1976; Castellani and Zanfei, 2006; Allayannis and Weston, 2001), neither IB nor finance researchers provide a comprehensive analysis of whether the use of financial derivatives rewards MNCs with higher value than domestic firms.

On the other hand, according to Castellani and Zanfei (2006), foreign affiliates of a MNC are firms having their parent companies abroad, while domestic MNCs are either headquarters or national affiliates. As such, it implies that advantages and costs incurred by domestic MNCs and foreign affiliates derive primarily from their different origins. Particularly, in a given country, foreign affiliates might be at higher position than local counterparts due to ownership advantages such as their parent companies' advanced financial resources, access to equity and capital markets, or knowledge-based capabilities (Chang, Chung, and Moon, 2013; Nguyen and Rugman, 2015). However, there also exists well-supported empirical evidence that foreign affiliates tend to be at a disadvantages compared with local counterparts as they often suffer from

various costs of doing business abroad owing to liabilities of foreignness[12] (e.g., Hymer, 1976; Zaheer, 2002; Castellani and Zanfei, 2006; Higón and Antolín, 2012). As foreign affiliates' advantages may or may not offset those costs, it remains unknown that under influence of corruption, whether foreign affiliates with derivatives activities are more valuable than domestic counterparts.

Third, we investigate how value implication of derivatives usage under corruption differs across domestic firms, domestic MNCs and foreign affiliates when they faced exogenous shocks brought about by the global financial crisis of 2007-2008. The crisis caused severe harms to the world economy and increased volatility, but the magnitude of crisis effects was different across countries and firms. Although there are numerous studies on its effects, little has been done to analyze its impacts on derivatives use. Therefore, we choose the period of 2003-2013, which provides a natural experiment of financial risks and risk management, to examine the dynamic of relationship between derivatives use and firm value before, during and after the crisis. Our study does not merely investigate consequences of the global financial crisis on value implication of derivatives usage, but concentrate on the role of corruption levels in mitigating adverse consequences.

The main findings of our study are as follows:

Results from OLS estimation and after controlling for endogeneity and self-selection bias consistently reveal that low corruption levels of home country (host country) induce the use of

[12] Liabilities of foreignness in a host country are defined as "all additional costs of a firm operating in a market overseas incurs that a local firm would not incur" (Zaheer, 1995: pp.343). These costs are directly related to institutional distance and foreign affiliates' weak link to local institutional setting (Zaheer, 2002; Bell, Filatotchev and Rasheed, 2012; Higón and Antolín, 2012)

financial derivatives and reward domestic firms and domestic MNCs (foreign affiliates) with higher value. In particular, derivative usage is value-enhancing activity for domestic firms and domestic MNCs, and it increases firm value of those firms from 9.87% to 11.77%, and 10.78% to 12.72% respectively, when they are in home country with low corruption environment[13]. Relatedly, although derivative usage does not add value to foreign affiliates, we find that they are more valuable in host countries where corruption is less severe[14]. We notice that hedging activities of domestic MNCs outperform domestic firms and foreign affiliates in terms of firm value under influence of corruption. Our empirical analysis also shows that during the crisis period, benefit of derivatives use on firm value does not gain for all firm types, and effect of low corruption levels on alleviating negative impacts of the crisis on derivatives usage is very moderate. Yet, low corruption level of home country is positively associated with hedging premiums of domestic firms and domestic MNCs in the post-crisis period.

We will develop this chapter as follows. Section 2 reviews existing literature and develop hypotheses. Section 3 discusses sample for this study, identifies dependent variables and explanatory variables and provides summary statistics. Section 4 describes model specifications. Section 5 presents the empirical results and analysis of the relationship between derivatives use and firm value. Section 6 summaries the study and draws conclusion.

[13] We define corruption levels based on corruption index (CPI index), in which those countries having scores greater than 75 are considered as low corrupt countries, and those countries having scores less than 75 are considered to be highly corrupt

[14] Our findings suggest that corruption environment may have stronger effect on the link between derivatives usage and firm value than other country-specific factors such as GDP per capita or the development of financial markets

5.2. Theoretical framework and hypotheses

In this study we carry out a conditional test on value effects derivatives usage in light of corruption environment because chapter 4 evidences that heterogeneity in the economic, political and social environments of a country plays a key role in the firms' hedging behaviours. Our study is built on the following strands of literatures and hypotheses.

Derivatives use and firm value

Hedging theory argues that there is potential positive relationship between derivatives use and firm value. That link depends on the degree to which the use of derivatives effectively addresses market imperfections such as corporate taxes (see Smith and Stulz, 1985; Mayer and Smith, 1990), financial distress or bankruptcy costs (Nance *et al.*, 1993; Froot *et al.*, 1993), or agency costs of debts (Mayer and Smith, 1982; Bessembinder, 1991). On the other hand, Stulz (1996) postulates that the primary objective of risk management is to mitigate the likelihood of costly lower-tail outcomes that may cause financing constraints or impede a firm to carry out its investment projects. Financial derivatives are risk management instruments, so if the use of derivatives generates positive cash flows or value, then those derivatives are deemed to hedge against firm's risks, leading to increase in firm value.

Although 90% firms of Fortune 500 have been using derivatives, derivative trading in Asia-Pacific accounts for approximately one-third of trading volume all around the world[15] and their use continues to increase, the influence of derivatives use on firm value has not received enough attention until recently. So far, the literature regarding value effect of derivatives usage provides

[15] Bartram, M.S., Brown, W.G. & Conrad, J. 2011, "The effects of derivatives on firm risk and value", *Journal of Financial and Quantitative Analysis*, vol. 46, no. 4, pp. 967-999.

FIA. 2015. *FIA annual volume survey*. Future Industry Association

overall mixed results. A large body of previous studies invariably focused on unconditional value effects of derivatives use, and have reported broadly consistent with the notion that derivatives use is value-increasing activity (e.g., Allayannis and Weston, 2001; Clark and Judge, 2009; Campello, Lin, and Zou, 2011; Chen and King, 2014) but the estimated magnitudes of the hedging premium vary across the studies, which ranges from as low as 1.8% to as high as 34%. Some others have found a negative relationship between the use of derivatives and firm value (e.g., Nguyen and Faff, 2010; Supanvaij, 2011) or no effect (e.g., Belghitar, Clark, and Mefteh, 2013). Thus, some researchers raise doubt about the relationship between derivatives use and firm value, and findings of other earlier studies (Guay and Kothari, 2003).

Recently, a few researches have implemented conditional test to scrutinize value implications of derivatives usage in light of some corporate issues such as corporate governance or agency problems (e.g., Fauver and Naranjo, 2010; Allayannis *et al*., 2012); as Fauver and Naranjo (2010) argues that firms have internal problems which may lead to a potential loss in firm value, so net value impacts of derivatives use is an empirical issue.

In the context of East Asia, there is only limited empirical evidence on the association between derivative use and firm value. To our best knowledge, no study directly investigates that relationship across countries in East Asia, but a few examine the value effects of derivatives usage across industries of one country. Ameer (2009) finds that although the use of derivatives has value relevance, its contribution to a firm's valuation is very minimal for a sample of 40 Malaysian firms. In investigation of both financial and non-financial firms in Indonesia, Oktavia (2012) evidences that the use of derivatives by non-financial firms can enhance shareholder value, but it does not affect earnings of banks.

Institutional theory, corruption, the use of derivatives and firm value

While acknowledging the contributions of firm determinants, scholars in the field of international business have stressed the importance of institutional variation across countries and claimed that country- specific factors contribute to explain the differences in performance and behaviors of firms. North (1990, 1994) is among the first to emphasize the importance of national institutions, considers institutions much more than background conditions, and defines institutions as "rules of the game" including formal rules (laws, regulations) and informal constraints (customs, norms, cultures), which organizations must follow. As such, institutions shape firm actions, determine transaction costs and transformation costs of production, eventually the outcomes and effectiveness of organizations (Khanna and Rivkin, 2001; He, Tian, and Chen, 2007), and frame the strategic choices facing organizations (Peng, Li, and Wang, 2005).

However, all governments and institutions never work only for public benefits but pursuing legitimate objectives by the presence of corruption (Rodriguez, Uhlenbruck, and Eden, 2005). Corruption reflects political institutions, thus, corruption environments are at different degrees in different countries, and countries differ remarkably in the extent to which corruption affect firms' performance[16]. The theory here is that corruption may have a strong effect on hedging costs and other transaction costs, thereby reducing expected cash flows, and ultimately value of firms using derivatives. This is consistent with the extant studies (e.g., Habib and Zurawicki, 2002; Shleifer and Vishny, 1993) demonstrating that corruption is considered to be a more costly tax on business operation than legal taxes because they are constrained to waste their resources on unproductive actions (Kaufmann and Wei, 1999). As such, corruption may dramatically

[16] According to Transparency International, "corruption is the abuse of entrusted power for private gain". https://www.transparency.org/what-is-corruption/

increase risk perception of capital market participants and affect expected return because the risk-return tradeoff states that expected excess market return should vary positively to market volatility. Consistently, Lee and Ng (2006) find that a country's corruption is negatively related to expected cash flows, and may have substantially adverse impact on shareholder value.

Furthermore, although up to date the existing literature has been silent about the influence of corruption on value effects of derivatives use, some researchers (e.g. Venard and Hanfi, 2007; Foss, 2010; Petrou, 2014, among others) observe that firms' exposure to corrupt countries in their business operations may translate to real financial losses for them. More clearly, firms that operate in countries with a high level of corruption are likely to engage in costly market transactions and less efficient transformation because that country is likely to have lower quality of infrastructure services, economic growth and financial stability (Rose-Ackerman, 1978, 1999). The existing literature also shows that a higher level of corruption is associated with higher borrowing cost, worse corporate governance, and lower stock valuation. In their analyses, Donadelli, Fasan, and Magnanelli (2014) evidence that firms operating in highly corrupt countries tend to have relatively low returns. While those firms operating in countries with lower level of corruption can capitalize on the advantages generated by a more favorable institutional context for firms, which in turn has a positive influence on performance and profitability of firms (Levy and Spiller, 1994; Bergara, Henisz, Spiller, 1998). Chapter 4 also find that a lower corruption level correlates with higher hedging intensity in the case of East Asian firms.

Building upon both literature on derivatives use and corruption, we therefore hypothesize the following:

Hypothesis 4: The lower is the corruption level; the higher is the likelihood that the use of financial derivatives increases firm value

The use of derivatives and firm value for domestic firms, MNCs, and foreign affiliates

We conjecture in the foregoing section that the value effect of derivatives use is likely to be higher for those firms operating in countries with lower level of corruption. However, derivatives use under influence of corruption environment does not have the same value effect on all types of firms. In this study, we investigate that dynamic relationship on comparison of foreign owned firms (i.e., foreign affiliates) and domestic owned firms, which are broken down into in domestic firms and MNCs.

A particularly important distinction between domestic MNCs and foreign affiliates is the assertion that the former's organizational routines and management process are rooted in local institutional conditions (Bruton, Ahlstrom, and Obloj, 2008), and they have well developed access to the relevant information and knowledge about the local institutional setting for effectively running their operations, including economy, social needs and preferences, norms, cultures and law (Nachum, 2003; Bell *et al.*, 2012); while the latter is embedded in institutional settings of both home and host countries, so they often experience liabilities of foreignness. On the other hand, in spite of being actively embedded in local institutional settings, the fundamental distinction between domestic MNCs and domestic firms is based on multinationality. Thus, we follow Higón and Antolín (2012) in arguing that comparison of domestic MNCs and domestic firms is symptomatic of multinatinality effect, while comparisons of MNCs and foreign affiliates reveal the effect of foreignness.

Firstly, in comparison with domestic firms, IB literature often argues that MNCs possess some firm-specific advantages (FSA)[17], which compensate for high cost of international

[17] FSAs are benefits and strengths specific to a firm as compared to rivals, such as management and administrative knowledge, know-hows, marketing, innovation (Rugman, 1981)

operation and enable them to compete successfully. Indeed, following OLI theory (Buckley and Casson, 1976; Dunning, 1977), IB scholars have found that MNCs should be able to exploit cost differentials on a global scale due to multinationality (Allen and Pantzalis, 1996; Chung *et al.*, 2010).

Multinationality gives MNCs an ability to diversify portfolio of firms, making MNC's cash flows less dependent on domestic market-level cash flows (Krapl, 2015), ultimately decreases the volatility of a company's cash flows and earnings, hence improves firm value (Rugman, 1976; Khanna and Yafeh, 2005). By virtue of multinationality, MNCs themselves are likely to reduce the probability of bankruptcy (Michel and Shaked, 1986), overcome inefficiencies arising from high agency and information costs (Khanna and Yafeh, 2005), as well as to provide shareholders with lower systematic and idiosyncratic risk, and superior return opportunities relative to domestic firms (Fatemi, 1984).

Furthermore, MNCs also develop expertise in hedging risks and are more likely to possess superior capability of reducing exposures to market risks such as exchange rate risks by using financial derivatives (e.g., Allayannis and Ofek, 2001; Choi and Jiang, 2009), which leads to lower cost of capital. Also, MNCs transfer material and knowledge resources among affiliates, thereby reducing not only the cost of acquisition of those resources for affiliates but also contribute to hedge against market risks. These advantages may attribute to an increasing firm value of MNCs.

Secondly, in terms of foreign affiliates, Kostova, Roth, and Dacin (2008) recognize that liability of foreignness is the key driver behind their missteps and inefficiencies. Foreign affiliates often bear higher costs arising from liability of foreignness such as costs and risks of exchange rate fluctuation, high agency and information costs, which arises from their lack of

knowledge about local cultures and networks connecting them with important actors in host country's economy, in general, from their weak link to institutional setting of host country (Hymer, 1976; Zaheer, 2002; Nachum, 2003; Castellani and Zanfei, 2006; Higón and Antolín, 2012).

We follow Higón and Antolín (2012) among others in assuming that the key driver behind foreignness is the institutional distance between home and host country. Specifically, it has long learned that the physical distance between the headquarter in a different country and foreign affiliates increases the governance, communication, and travel costs associated with managing an overseas operation (Hymer, 1976; Zaheer, 2002). In terms of hedging activities, that physical distance may increase hedging costs, thereby reducing value effect of financial derivatives use. Khanna and Palepu (1997) also note that foreign affiliates face challenges arising from inconsistencies in the decision- and law-making by the regulatory institutions and governments of host country. Such inconsistencies adding difficulties in operations of foreign affiliates, thus exposing them to significant financial losses, and undermining derivative activities[18] Similarly, the distance in cultural and social orientations of the home and host countries creates an obstacle limiting foreign affiliates' abilities to gain legitimacy and other favorable economic transactions with local firms and government authorities (Peng and Luo, 2000; Luo, 2001; Makino *et al.*, 2004).

Moreover, Kostova *et al.* (2008), Petrou (2014) among others argue that idiosyncrasies of corrupt host country's institutions and regulations create additional issues, raise transaction costs and information asymmetries, which brings more challenges for foreign affiliates compared to

[18] Beck and Levine (2008) note that finance can be considered a set of contracts. Because derivatives are financial contracts, it is likely that legal institution influences derivatives use

domestic owned firms. Particularly, in a corrupt country, government officials in their search of bribes can constrain performance of foreign affiliates by changing structure of taxations, laws and regulations to impede foreign affiliates' participation in local competition and local resources (Lecraw, 1984; Contractor, 1990; Javorcik and Wei, 2009). Hymer (1976) also argues that governments also sometimes create costs arising from taxation differentials or bureaucratic delays in government approvals and paper-works for foreign affiliates and often put them at a disadvantage relative to local firms. Such unstable institutional environment threatens foreign affiliates, thereby increasing the costs of doing business (Makino *et al.* 2004) and costs of implementing derivatives activities in a host country. In all, it is likely that high costs of foreignness could worsen value effect of derivatives use of foreign affiliates.

Based on the above logic, we hypothesize the following:

Hypothesis 5a: In light of corruption environment, the use of financial derivatives is more valuable in domestic MNCs than in domestic firms

Hypothesis 5b: Under influence of corruption environment, the use of financial derivatives rewards domestic MNCs with higher value than foreign affiliates

Financial crisis, derivatives use, and firm value

We take into account the global financial crisis in the analysis of value effect of derivatives use under corruption environment. Researchers have found two separate and sequential effects of a crisis on firms. First, a crisis leads to sudden and big disruptions in demand, markets, which results in a decline in firms' investment opportunities, and higher cost of external borrowing due to a loss of access to outside financing (Chakrabarti, Singh, and Mahmood, 2007; Enikolopov, Petrova, and Stepanov, 2014), both of which imply a potential reduction in firm value. Second, when causes and consequences of a crisis become more obvious, firms restructure to adjust to a

new environment and to reduce exposures. Therefore, we argue that impact of derivatives usage on firm value is likely to be worse during the crisis period, but it is better in the aftermath of the crisis.

This argument, in addition, derives from the view that firms have difficulty in dealing with sudden and major external shocks (Greenwood and Hinnings, 1996; Rajagopalan and Spreitzer, 1997) and benefits of derivatives use from reducing exposures may not gain during a crisis period as the crisis brings about significant exchange rate volatility, and shape rise in financial costs and prices (Singh and Yip, 2000). Besides, firms with more complicated organizational structures will get into greater difficulties when big shock occurs (Hanna, Polos, and Carroll, 2003; Chakrabarti *et al.* 2007). Thus, those difficulties increase hedging costs, which offsets benefits from using financial derivatives.

Furthermore, we also expect that value effect of derivatives use for firms in low corrupt countries is less severely affected by negative impacts of the global financial crisis than those firms located in highly corrupt countries. This is because low corruption reduces agency costs, resulting in lower costs of capital, increased operational efficiency, and eventually better firm performance and valuation as growing empirical studies on corruption have shown (e.g., Lee and Hong, 2012; Petrou, 2015). Taken the above arguments together, our 3a and 3b hypotheses are yielded as below:

> *Hypothesis 6a: The global financial crisis worsens the value effect of derivatives usage under corruption environment, and there is a positive relationship between derivatives use and firm value in post-crisis period*
>
> *Hypothesis 6b: Low level of corruption mitigates negative impacts caused by the global financial crisis on the value effect of derivatives use*

5.3. Sample selection and variable construction

5.3.1. Data collection and descriptive statistics

Our sample consists of non-financial firms across various industries in 8 countries in East Asia, namely China, Hong Kong, Japan, Singapore, Malaysia, Thailand, Philippines, and Indonesia. It comprises of all firms that have accounting data over the period of 2003-2013 on the Datastream database, that have annual reports in English for the same years on the Moningstar and firms' website database. We exclude financial firms that are likely to have different incentives for using derivatives than non-financial firms. Our final sample contains 9691 firm-year observations; it is balanced panel data set of 881 firms.

All data set on derivatives contracts is hand-collected from 881 firms' annual reports, we classify firms as derivative users or non-users based on information about the use of derivatives. A firm is classified as a derivative user if a firm discloses that it uses at least one type of financial derivatives for hedging purpose. For those firms that do not disclose any use of financial derivative contracts, we classify them as non-derivative users. We also manually-collected notional amount of derivative contracts, and convert all these value into one common currency, that is USD. In addition, most of accounting data on explanatory variables are from Datastream; the missing variables are filled up by Bloomberg database or information in annual reports. These data are provided at a yearly frequency and in thousand USD.

From this total sample, 389 domestic firms, 427 domestic MNCs and 65 foreign affiliates are identified. We use Corporate Affiliations database to classify firm types. Following Pantzalis *et al*. (2001), we consider a firm as MNC if that firm has at least one majority owned foreign subsidiary, otherwise it is domestic firm. A domestic MNC is a MNC with parent company being located in any sample country. We define foreign affiliate as an independent organizational unit,

which is wholly or partially managed and controlled by a foreign parent MNC, and operating in a given host country.

Summary statistics on the use of derivatives by the sample firms is reported in the table 5.1. Across all countries, approximately 53.5% of our sample observations use at least one type of financial derivatives, indicating that the use of derivatives is common among non-financial firms in East Asian countries.

(INSERT TABLE 5.1 HERE)

In Panel B, mean value of any derivatives (foreign currency derivatives and/or interest rate derivatives and/or commodity derivatives) is about $339 million. When we calculate the mean of notional value of derivative contracts to total assets, they are about 64.7% for any derivatives These numbers speak themselves that non-financial firms in East Asian countries use financial derivatives very intensively.

Panel C exhibits the trend of derivatives use across the entire sample firm over time. There is obvious change in the use of derivatives before and after the global financial crisis. In particular, derivative usage increases remarkably in 2009 onwards in response to the crisis, which is shown by the number of derivatives users in post-crisis period of 55.89% compared to 49.72% in the pre-crisis period.

5.3.2. Dependent variable

Detailed information about the definitions of dependent variable and independent variablesx that we use in this study can be found in table 5.2.

(INSERT TABLE 5.2 HERE)

In this study, we use the most commonly used dependent variable in previous studies (e.g., Allayannis and Weston, 2001; Bartram *et al.*, 2011; Chen and King, 2014) – Tobin's Q as a

proxy for firm value. While there are many variants of Tobin's Q in the existing empirical studies, Tobin's Q is generally defined as the ratio of the market value of a firm to the replacement costs of assets. The measures of Tobin's Q broadly differ from whether elaborate algorithms are used to derive the market value of preferred stock and long-term debt as well as the replacement value of capital stock and inventories.

Yet, more elaborate algorithms for Tobin's Q do not improve quality of measurement, but they may lead to a sample-selection bias as a result of data unavailability as Erickson and Whited (2006) argued. Therefore, we construct Tobin's Q by calculating the ratio of a firm's market value of total assets (the book value of total assets minus the book value of equity plus the market value of equity) to the book value of total assets of that firm, evaluated at the end of fiscal year. Fauver and Naranjo (2010), Allayannis *et al.* (2012), and others use this same firm value measure for Tobin's Q. We compute Tobin's Q for a total of 9691 firm-year observations (881 firms per year). Similar to Allayannis and Weston (2001), among others, we use the natural logarithms of Tobin's Q in our multivariate tests to control for skewness.

5.3.3. Independent variables

1- The use of derivatives

Berkman and Bradbury (1996) state that the ideal measure of derivative usage is hedging ratio of the contracts being used for managing risk. According to this argument, we measure hedging activity by derivative use intensity, rather than derivative dummy variable. This method provides a direct view about the effect of derivatives usage on firm value, or in other words, the effect from the real hedging premium. We construct derivative use intensity, denoted as USE, for firms that make any reference in their annual reports to use derivatives for hedging purposes and disclose the notional amount of derivative contracts. Derivative use intensity is measured by the

fiscal year end total notional value of derivative contracts of a firm scaled by that firm's total assets, and it takes value of zero for non-derivative users. We anticipate a positive association between the use of derivatives (USE) and firm value (Tobin's Q).

In the analysis, we do not examine the effect of specific derivative types based on specific risks, namely foreign currency, interest rate and commodity price derivatives. We use the hedging intensity of using any derivative types, which present the overall derivatives use of a firm, as many firms in our sample use derivatives to hedge more than one type of risks. Judge (2003) shows that there will be confounding effects when firms, which do not hedge the specific risk under consideration, but hedge other type of risk exposures, are included in the sample as non-hedgers.

2- Corruption

To measure corruption levels, we collected Corruption Perception Index (CPI) from the Transparency International over the period of 2003-2013. This variable aggregates information from 13 sources originated from 11 independent institutions, consisting of surveys of business people and performance assessment from a group of country analysts. The CPI is calculated as the average standardized value from different sources to provide the overall extent of corruption. That index is on inverse ranking from 0 to 100, where higher index indicates lower level of corruption. A negative association between corruption and firm value, that is positive estimated coefficient on that index, is expected. We further explore value effects of derivatives use under influence of corruption environment by constructing interaction term of corruption and hedging intensity

5.3.4. Control variables

Following prior studies (e.g., Allayannis and Weston, 2001; Fauver and Naranjo, 2010; Bartram *et al.*, 2011; Allayannis *et al.*, 2012), we use several firm- and country- specific variables to control for factors that have been shown to influence firm value.

1. Firm size: Previous empirical evidence on effect of firm size on firm value is ambiguous. Allayannis and Weston (2001), Belghitar, Clark, and Mefteh (2013), Chen and King (2014) and some others find negative relationship between firm size and firm value. Yet, Magee (2008), Supanvanij (2011) report a positive coefficient on firm size, indicating that there may be a non-linear effect of firm size on value of firm. Therefore, we use natural logarithm of the book value of total assets as a proxy for firm size, and do not provide an ex ante prediction regarding effect of firm size on firm value.

2. Leverage: The literature on capital structure suggests that a firm's choice of capital structure may affect its market value when there are market imperfections (see Harris and Raviv (1991) for literature review). Specifically, Zou (2010) argues that leverage also can provide tax benefits of debts, thereby improving firm value. Some other studies find that leverage can act as negative signal of investment opportunities owing to agency costs of debt, suggesting a negative relationship between leverage and firm value (e.g., Magee, 2008, Belghitar *et al.,* 2013). We therefore use the ratio of total debts to total assets as our definition of leverage and have no expectation on the sign of the relationship between leverage and Tobin's Q.

3. Profitability: Profitability is supposed to have positive effect on valuation of a firm because it is likely that the marketplace rewards a more profitable firm with higher value compared to a less profitable firm as Allayannis and Weston (2001) and Belghitar *et al.* (2013) argue. As a result, if a derivative user is more profitable, it more likely to have higher firm value.

We use return on assets (ROA), defined as the ratio of net income to book value of total assets, to control for profitability, and expect a positive coefficient on this variable.

4. Investment growth: Myer (1977), Froot *et al.* (1993), among others suggest that firm value is dependent on future investment opportunities. In empirical studies, Allayannis *et al.* (2012), Marami and Dubois (2013) and some others find that investment growth is an important determinant of Tobin's Q. In line with prior studies, we use ratio of capital expenditures to net sales to control for a firm's investment opportunities and expect a positive association with firm value.

5. Liquidity: The free cash flow hypothesis (Jensen, 1986) states that firms with excess free cash flow are likely to invest in negative NPV projects, resulting in lower firm value. Pramborg (2004), Bartram *et al.* (2011) and some others find evidence consistent with that argument. Yet, Campa and Kedia (2002) and Allayannis *et al.* (2012) find contrary results. Thus, we have no conjecture on the sign of an association between liquidity and Tobin's Q. We use quick ratio, defined as cash plus short-term investments divided by total current liabilities, as a proxy for liquidity.

6. Access to financial markets: If derivative users have limited access to financial markets, their firm value may be high because they are financial constraints, so their managers add incentives to undertake only the highest NPV projects as Allayannis and Weston (2001), and Jin and Jorion (2006) noted. As in Clark and Judge (2009), Belghitar *et al.* (2013) we use dividend yield, which is measured by common dividend per share divided by the fiscal year end share price, to proxy for ability to access financial market, and we expect a negative relationship with firm value.

7. Geographic diversification: The evidence on influence of geographic diversification (multinationality) on firm value in the existing literature is ambiguous. Makar and Huffman (2001), Fauver and Naranjo (2010), among others, evidence that geographic diversification is positively related to firm value, while Denis, Denis, and Yost (2002), Marami and Dubois (2013) find a negative relationship. Nevertheless, following Allayannis and Weston (2001), we use the ratio of foreign sales to total sales, denoted as FORSALES, to measure multinationality in this study. We expect that it is positively associated to firm value. We also use dummy variable GEOMARKT, which has a value of one for firms that have sale markets in foreign countries, and zero otherwise, as an alternative measure for geographic diversification.

8. Industrial diversification: There are competing arguments concerning about whether diversification increases firm value. Some studies indicates that diversified firms are valued relatively lower than non-diversified firms (e.g., Lang and Stulz, 1994; Allayannis and Weston 2001), while some others (e.g, Zou, 2010, Allayannis *et al.*, 2012) find evidence that diversified firms receive a premium in valuation. We control for effect of industrial diversification on firm value by using diversification dummy, which equals one for firms operating in more than one business segment in the SIC industry classification, and zero otherwise.

9. Country-level control variables: We control for country effects and country's time invariant characteristics by using GDP per capita ratio to proxy for relative performance of the countries, and financial system deposits to GDP, which is defined as demand, time, saving deposits in deposit money banks and other financial institutions as a share of GDP, to proxy for financial market development. These variables are obtained from the World Bank's World Development Indicators. An increase in GDP per capita and financial system deposits to GDP

gestures growth in the economy and tends to signal an improvement in productivity and firm value. Thus, a positive relationship between firm value and these variables is expected.

5.4. Methodology for investigating value effects of derivatives use

To scrutinize the value effects of derivatives use by non-financial firms, this thesis will employ the most commonly used approach in previous studies, Tobin's Q. Since its introduction to the literature of financial economics approximately a half of century ago, Tobin's Q has become an increasingly popular measure of firm performance. As defined by Brainard and Tobin (1968) and Tobin (1969), Tobin's Q is the ratio between the firm's market value and the replacement cost of its capital stock, this ratio has become known as Tobin's average *Q* or Tobin's Q in short. As such, they argue that investment is stimulated when capital is valued more highly in the market than it costs to manufacture it, and deterred when its valuation is less than its replacement cost. Another way to indicate the same point is that firms which display Tobin's Q greater than unity are judged as using scare resources effectively, and those firms with Tobin's Q less than unity are considered as using resources poorly. Because of that, Brainard and Tobin (1968) and Tobin (1969) propose that this ratio be used to measure the firm's incentive to invest in capital.

To the best of our knowledge, Allayannis and Weston (2001) is the first to apply this methodology to examine the effect of derivatives use on firm value. Following Allayannis and Weston (2001), among others, we define Tobin's Q as the ratio of firm's market value to replacement costs of assets, evaluated at the end of the fiscal year for each firm. We then need to estimate Tobin's Q for each firm in the sample. Lindenberg and Ross (1981) developed methodology for measuring Tobin's Q, which has become the roadmap for subsequent studies, in which it is expressed as below:

$$\text{Tobin's Q} = \frac{\text{Market value of the firm}}{\text{Total replacement cost of assets}}$$

$$= \frac{\text{Market value (equity + debt + preferred stock)}}{\text{Replacement cost (plant + equipment + inventories)}}$$

Our methodology for constructing market value of the firm closely follows Perfect and Wiles (1994), Lewellen and Badrinath (1997), and Allayannis and Weston (2001). According to Perfect and Wiles (1994), market value of a firm in year *t* is the sum of year-end market values of equity, debt and preferred stock. The year-end market value of a firm's equity is estimated by year-end per share stock price multiplied by number of outstanding shares. Market value of a firm's preferred stock is the total preferred dividends capitalized by preferred stock yield index.

Lewellen and Badrinath (1997) and Allayannis and Weston (2001) propose somewhat different estimation of the firm's market value. In their estimation, market value of a firm consists of short-term debt, long-term debt, preferred stock and common stock. They suppose that short-term debt has a market value equal to book value, while long-term debt is estimated by using a recursive methodology that measures maturity structure of a firm's long-term debt and accounts for changes in the yield on A-rated industrial bonds. Additionally, the market value of common stock is estimated by year-end share price multiplied by number of outstanding shares. Lewellen and Badrinath (1997) estimates preferred stock as annual dividend obligations divided by the prevailing yield on medium-grade preferred, while Allayannis and Weston (2001) measures market value of preferred stock using the year-end redemption value, which is suggested by Lang and Stulz (1994).

By the same token, to calculate the replacement cost of assets, we follow the procedure outlined in studies by Perfect and Wiles (1994), Lewellen and Badrinath (1997), and Allayannis and Weston (2001). Perfect and Wiles (1994) notes that a firm's assets can be decomposed into three constituents: a) plant and equipment; b) inventories, and c) others. The replacement cost of plant, equipment and inventories are estimated by using three methodologies that employ a firm's replacement cost estimates, or time series estimates based on historical data or both. The first methodology uses replacement cost figures provided by the firm. The second method is derived from model of Lindenberg and Ross (1981), and the third technique calculates the end-of-year book value of a firm's total assets.

In this study, we follow Lewellen and Badrinath (1997) and Allayannis and Weston (2001) approach of constructing replacement cost of assets, which is both simpler and more accurate. In their procedure, the replacement cost of assets is estimated as the sum of replacement cost of fixed assets plus inventories. As such, they calculate replacement cost of fixed assets by deducing the vintages[19] and depreciation pattern of in-place gross fixed assets. In addition, the replacement cost of inventories is measured as the sum of book value of inventories plus LIFO[20] reserves. Allayannis and Weston (2001) demonstrates that the advantage of this methodology for estimating replacement cost is that it does not hinge on any initial conditions or "recursive build-up" period, which can lead to a serious impact on both the magnitude and ranking of Tobin's Q across firms as indicated by Lewellen and Badrinath (1997).

[19] Lewellen and Badrinath (1997) explain that asset vintages are assets in place for a firm on the date when a replacement cost measure is desired.

[20] LIFO stands for "Last in, First out", an inventory accounting. Under this method of accounting, the last items placed into the firm's inventory are supposed to be the first ones sold (see Perfect and Wiles, 1994).

The review in chapter 3 showed that in previous studies on relationship between derivatives use and firm value, explanatory variables for the use of derivatives are dummy variable denoting the availability of derivatives use by firms, or notional value of derivatives, or both. In this thesis, we will perform our analysis based on notional value of derivatives.

In testing the above-stated hypotheses, our baseline models can be written in condensed forms in Equation (5.1) as below

$$Ln\ (Tobin's\ Q)_{ijt} = \alpha_{use}USE_{ijt} + \alpha_c C_{jt} + \lambda_{use\_c}USE_{ijt} * C_{jt} + \alpha_x X_{ijt} + u_{ijt} \quad (5.1)$$

i= 1..n; j= 1-8; t= 2003-2013

Where:

$Ln\ (Tobin's\ Q)_{ijt}$: Firm value of firm *i* located in country *j* in year *t*, measured by natural logarithm of book value of total assets minus book value of equity plus market value of equity to book value of total assets

USE_{ijt}: Derivatives use intensity of firm *i* located in country *j* in year *t*, measured by notional amount of derivative contracts scaled by total assets.

C_{jt}: Corruption index of country *j* in year *t*, which is inverse ranking of country corruption levels on a scale from 100 (very clean) to 0 (highly corrupt) (from the Transparency International)

X_{ijt} is a vector of firm-and country-specific variables in year *t*, including firm size, leverage, ROA, capital expenditures, quick ratio, dividend yield, foreign sales to total sales, financial system deposits to GDP, and GDP per capita.

u_{ijt}: Error terms clustered by country

In our initial tests, we use OLS estimation of equation (5.1) for the subsamples of domestic firms, domestic MNCs, and foreign affiliates. To control for unobserved time-varying effects and

measure within-country and within-industry differences in the effect of derivatives use and corruption on firm value, we adopt country, industry and year fixed effects. Furthermore, it is likely that standard errors are inflated due to dependence at the firm level at a pooled cross-section regression, so we employ clustering method, which is developed by Rogers (1993) to adjust for heteroscedasticity and serial correlation of standard errors.

We then assess robustness of our results by carrying out additional investigations. First, we acknowledge that it is possible that the observed relationship is subject to endogeneity. To address this concern, we implement instrumental variable (IV) model. Second, our sample confirms previous results in the existing literature that the characteristics of firms using derivatives on average are quite different from those firms do not. These differences are likely to lead to a selection-bias when investigating value effects of derivatives use under corruption. To control for the self-selection bias, following Bartram *et al.* (2011), Chen and King (2014), we employ the Heckman treatment effect model. Third, we carry out an additional robustness test to check the stability of value effects of derivatives use on by using alternative proxy for firm value, that is firm market value in thousand USD, calculated by a firm's share price multiplied by the number of ordinary shares in issue.

5.5. Empirical results and analysis

5.5.1. Univariate results

In this section, the main hypothesis we examine is whether the use of derivatives is rewarded by investors with higher valuation by comparing the value of Tobin's Q of derivative users versus non-users. For domestic firms, the mean of Tobin's Q for users is 0.509, compared with a mean of Tobin's Q for non-users of 0.418, leading to a hedging premium of 0.091 ($p <$ 0.1). This result conforms to our hypothesis that derivatives users have a higher firm value than

non-users. In the case of domestic MNCs, we also obtain a positive hedging premium of 0.355 ($p < 0.01$). In contrast with our hypothesis, in terms of foreign affiliates, non-users are characterized by higher Tobin's Q than users (the means of Tobin's Q are 0.715 and 0.702 for non-users and users, respectively). This result leads to a statistically significant hedging discount of 0.013, and implies that the use of derivatives may not be a value-enhancing activity for foreign affiliates.

(INSERT TABLE 5.3 HERE)

The second hypothesis we want to test is that whether corruption environment affects derivatives use and firms are likely to use derivatives when they are operating in country with low corruption level. In line with our hypothesis, for domestic MNCs, we find that countries where derivative users are located and operating have lower level of corruption (the mean of corruption is 64.338) than countries where non-users are (the mean of corruption is 54.881). The difference between users and non-users are strongly significant. In the case of domestic firms, although we find that firms using derivatives are located in country with lower corruption than those firms do not, the mean difference between them is not different from zero at any conventional significance level. Specially, we obtain a surprising result for foreign affiliates that derivatives users are located in countries with slightly higher corruption level than non-users. These results altogether suggest that corruption environment affects firms' hedging behavior, but magnitude of its effect varies across different firm types.

Furthermore, we investigate how firm-specific resources and capabilities between derivative users and non-users may affect firm value. On average, we find that firms using derivatives are larger, more profitable and have higher level of exposures than those firms do not as shown by means of firm size, ROA and foreign sales to total sales. These results are consistent with the previous studies such as Allayannis and Weston (2001), Allayannis *et al.* (2012).

5.5.2. Multivariate analysis

5.5.2.1. Value effects of derivatives use under influence of corruption environment

Table 5.4 presents results of a pooled OLS estimation for the sample of domestic firms, domestic MNCs, and foreign affiliates, where we classify firms in accordance with Pantzalis *et al*. (2001). Paying our attention to the derivative use intensity variable, corruption, and the interaction of derivatives use and corruption, we find several interesting results. For domestic firms, we observe that there are positive and significant estimated coefficients on derivatives use and corruption (0.0418, 0.154, and 0.0759, respectively, $p < 0.01$). Due to inverse ranking of corruption level, these results suggest that effects of derivatives usage on value of domestic firms vary with the corruption levels of home countries. Specifically, in low corrupt countries[21], the use of derivatives increases value of domestic firms from 9.87% to 11.77%, conforming to the finding of chapter 4 that the lower the corruption, the higher likelihood that firms use derivatives. The hedging premium is lightly higher than the premium of 4.87% - 6.33% reported by Allayannis and Weston (2001), Nain (2004), Kim, Mathur, and Nam (2006), Magee (2008) for samples of U.S firms, but broadly similar to 12% found by Clark and Judge (2009) who use a sample of 412 UK firms.

(INSERT TABLE 5.4 HERE)

For domestic MNCs, we find results generally consistent with our hypotheses. In particular, a lower corruption level (higher CPI index) is associated with a higher firm value as evidenced by significant and positive coefficient estimate for corruption ($p < 0.01$). We also find both statistically and economically significant coefficients on derivatives use and derivatives use

[21] We define corruption levels based on corruption index (CPI index), in which those countries having scores greater than 75 are considered as low corrupt countries, and those countries having scores less than 75 are considered to be highly corrupt countries

interacted with corruption (0.0494 and 0.0778, respectively). These results indicate that domestic MNCs are likely to use financial derivatives in countries with low corruption, and such corruption environment facilitates the use of derivatives and rewards those firms with higher firm value. Despite conforming to our Hypothesis 5, however, we can notice that the difference in hedging premium of domestic MNCs compared to domestic firms is not striking (4.94% - 12.72% versus 4.18% - 11.77%).

In contrast with the above findings, when we analyze results for the case of foreign affiliates, we find strong evidence that the use of derivatives decreases firm value with hedging discount of 7% ($\beta = -0.07, p < 0.01$). It can be partly attributed to the fact that their business operations are more complicated than those of domestic firms (Kim and Pantzalis, 2003), and they have institutional duality pressure to which they have to comply with both practices of their parent companies and host countries (Nell, Puck, and Heidenreich, 2015). Another possible explanation is finding of Chan, Isobe, and Makino (2008) is that performance of foreign affiliates in some emerging countries, such as China, Indonesia and Thailand, is "high risk, low return".

However, we also observe that coefficient on interaction term between derivative use and corruption is highly significant and positive ($\beta = 0.0570, p < 0.01$). It supports the Hypothesis 5b and suggests that foreign affiliates, which reside in a country with a low corruption environment, engage in financial derivatives usage, are significantly more valuable than those affiliates, which reside in a country with a high corruption level.

When we look at results of other independent and control variables, although effects for firm- specific and country-specific factors are broadly similar across subsamples, some different characteristics seems to be important to explain different effects of derivatives use on firm types. *First*, we observe that diversification indicator negatively affect firm value of foreign affiliates,

while it does not influence value of domestic firms and domestic MNCs. This result complies with the notion of Denis *et al.* (2002), Fauver and Naranjo (2010), Marami and Dubois (2013), among others, that on average, industrial diversification is harmful to firm value.

Second, we find that the exchange risk exposure, measured by foreign sales to total sales (FORSALES) is actually significant for domestic firms (β = - *0.0466, p <0.1*) but not for domestic MNCs, and foreign affiliates. This result supports finding of Choi and Jiang (2009) and may explain why value implication of derivatives use does not differ significantly between domestic firms and domestic MNCs as Géczy *et al.* (1997), Allayannis and Ofek (2001) state that a firm with higher ratio of foreign sales to total sales is more likely to use derivatives to hedge exposures, thereby increasing firm value.

5.5.2.2. The link between derivatives use and firm value under corruption in the pre-, during-, and post- crisis periods

We find interesting evidence that the incidence of financial derivatives use prior to the crisis is related to a reduction of 3.37% in domestic firms' value ($p < 0.01$), while it does not affect value of MNCs and foreign affiliates. Similarly, the interaction term of derivatives use and corruption does not have significant effect on firm value of both domestic MNCs and foreign affiliates. Although the coefficient on such variable is highly significant and positive in the case of domestic firms, however, the effect is modest ($\beta = 0.0154, p < 0.01$). On the other hand, we observe that the estimated coefficients on FORSALES are not different from zero at any conventional significance level for the case of MNCs and foreign affiliates, but it is positively associated with domestic firms' value. This result indicates that exposures are less significant for domestic MNCs and foreign subsidiaries than domestic firms; while the use of derivatives may be unable to mitigate exposures that domestic firms face, consequently, reduces firm value. This

can be partly attributed to the finding of Guay and Kothari (2003) that the use of derivatives seems to be a small part in non-financial firms' risk profile.

(INSERT TABLE 5.5 HERE)

During the crisis period, in response to the increased exposure, derivatives users are found to intensify the extent of derivatives use and there is substantial increase in the proportion of firms that make use of derivatives as shown in the table 5.1. However, we can notice that the use of derivatives decreases firm value of both domestic firms and domestic MNCs, but domestic MNCs experience more significant drop in their value relative to domestic firms (β = *-0.1379 versus* β = *-0.0749*), while it has no impact on foreign affiliates' firm value. This result suggests that value impact of derivatives use on domestic MNCs is more sensitive to the crisis than other firms.

More remarkably, in line with our Hypothesis 6b, we find that low level of corruption alleviates negative impacts of the crisis on value implication of derivatives use for domestic firms and domestic MNCs, however, that effect is very moderate (β = *0.0014* and *0.0038*). This finding supports the premise that the financial crisis causes a sudden and big exogenous shock, firms are unable to adjust to new system (Chakrabarti *et al.*, 2007, Enikolopov *et al.*, 2014), the use of derivatives cannot reduce exposures to market risks while hedging costs is higher due to fluctuation in exchange rates and escalation in financial costs and prices, which all leads to a hedging discount. Under such disruptions caused by the crisis, in addition, the extent of corruption in the home or host country would be of less concern from the perspective of a firm's hedging behaviors.

In the post-crisis period, we obtain results broadly similar to findings in the previous section. The use of derivatives adds value to both domestic firms and domestic MNCs ($\beta_{domestic\ firms}$ =

0.124, p <0.1; $\beta_{Domestic\ MNCs}$ *= 0.0939, p <0.05*), showing that derivatives use is more efficient value-enhancing activity after the crisis. More interestingly, we notice that the home country's level of corruption is more associated with the impact of derivatives usage on firm value of domestic MNCs than on domestic firms, and its low corruption level rewards domestic MNCs with higher firm value ($\beta_{domestic\ firms}$ *= 0.124, p <0.1;* $\beta_{Domestic\ MNCs}$ *= 0.0939, p <0.05*). In addition, we find strong evidence that the use of derivatives decreases firm value of foreign affiliates by 9.51%, but MNC subsidiaries are more valuable in host countries where corruption is less severe as evidenced by the estimated coefficient on variable derivatives use interacted with corruption (β *= 0.0154, p <0.05*).

5.5.3. Robustness tests

5.5.3.1. Instrumental variable (IV) model: controlling for potential endogeneity problem

To address the potential issue of endogeneity due to omitted variables and reverse causality, we implement the instrumental variable (IV) method similar to Graham and Rogers (2002), Allayannis *et al.* (2012), among others. In this approach, derivative use intensity is regarded as an endogenous variable. The first stage of IV regression is an OLS regression model of derivatives use on all of other explanatory variables in equation 6.1; in the second stage, we apply the two-stage least squares (2SLS) to obtain efficient estimators for endogeneity.

(INSERT TABLE 5.6 HERE)

In the first stage, to identify instrumental variables, we employ some instruments suggested by previous studies that are potentially related to derivatives use, but are unrelated to firm value. More specifically, based on the idea of Campello *et al.* (2011) about a tax-based instrumental approach, we use first difference of tax rate, defined as income taxes to pre-tax income, as the instrument. On one hand, the theoretical research linking derivatives use and tax benefits suggest

that progressive marginal tax rates, together with the existence of tax shields such as tax credits, tax loss carry forwards are closely related to the decision to hedge (e.g., Smith and Stulz, 1985; Stulz, 1996, among others). On the other hand, Campello *et al.* (2011) express that tax convexity is a non-linear function of taxable income, tax codes, and various tax credits. Thus, this measure exhibits characteristics of tax system and structure, ultimately lead to an exogenous variation to identify the unbiased influence of derivatives use on firm value.

In accordance with Allayannis *et al.* (2012), we use exchange rate regime dummies to indicate whether a country has an independently floating, managed floating or fixed exchange rate regime. The type of exchange rate regime is likely to be the strongest factor affecting exchange rate volatility as Kocenda and Valcachy (2006) discussed, consequently affects firms' decision to use derivatives, especially foreign currency derivatives. However, exchange rate regime is a part of monetary policy, and may differ among countries due to differences in exchange rate regime which can be explained by factors such as different parties having different macroeconomic preferences, the timing of election, the degree of central bank independence, and the type of political system (Bernhard and Leblang, 1999; Frieden, Ghezzi, and Stein, 2001; Setzer, 2005). Therefore, it may be unrelated with firm value. In this study, we define three types of dummy variables regarding to whether a firm is located in a country following the floating exchange rate regime (Japan, Indonesia, and Philippines), whether an observation is based in a country insisting on the managed floating exchange rate regime (Thailand, Singapore and Malaysia), and whether a firm belongs to a country that using the fixed exchange rate regime (China and Hong Kong).

For brevity, we only report the results of the second-stage IV estimation in the table 5.6. To substantiate if the instruments are weak instruments, we estimate Kleibergen-Paap Wald rank F

statistic. The F statistics are always greater than Stock and Yogo (2005) critical value (or greater than 10), implying rejection of null hypothesis that the instruments are weak. In addition, the Kleibergen-Paap Wald rank LM statistics are strongly significant ($p < 0.01$), indicating that the IV model does not have an under-identification issue.

There are consistent estimates of the second-stage valuation results controlling for potential endogeneity issue and our OLS results obtained from table 5.4. We find statistically and economically significant hedging premium for both domestic firms and domestic MNCs operating in low corrupt countries, indicating that countries with low corruption induce domestic firms and domestic MNCs to use financial derivatives for hedging and rewards those firms with higher value. However, we observe that after accounting for potential endogeneity issue, the estimated coefficients on derivatives use and interaction term between derivatives usage and corruption in the case of domestic MNCs (0.0733 and 0.1203 respectively) are higher in magnitude than OLS estimate (0.0494 and 0.0778), but in the case of domestic firms, these coefficients are lower (0.0371 and 0.0429 compared to 0.0418 and 0.0759 in OLS).

More importantly, these results indicate that intensifying derivatives use enables domestic MNCs to increase firm value more efficiently than domestic firms. It also supports the views of international business and finance researchers that domestic MNCs can attain higher performance capitalizing on their FSAs (e.g., Buckley and Casson, 1976; Dunning, 1977, Chung *et al.* 2010; Lee and Rugman, 2012), and domestic MNCs with derivative policies outperform domestic firms due to their superior ability to engage in financial and operational hedging, which should be able to offset some risk exposures they face (Lin, Pantzalis, and Park, 2009; Choi and Jiang, 2009).

On the other hand, in line with the previous findings, we find that the use of financial derivatives decreases firm value of foreign affiliates by 5.28%, which is lower than hedging discount of 7% found in OLS estimation. More importantly, we find interesting evidence that low corruption enhances effects of derivatives use on foreign affiliates' value, coefficient on derivatives use ranges from -0.0528 to 0.0082 ($p < 0.01$). These results altogether strongly support our hypothesis that in low corruption environment, the use of derivatives is likely to increase firm value, and it rewards domestic MNCs with higher value than domestic firms and foreign affiliates. Critically, the results from IV estimation imply that our inferences from OLS estimation are robust.

5.5.3.2. Heckman treatment model: controlling for self-selection bias

In this section, following Chen and King (2014), Lievenbruck and Schmid (2014) we execute treatment effects model as in Heckman (1979) to control for self-selection bias. The corresponding results for the second stage estimations for domestic firms, domestic MNCs, and foreign affiliates are reported in the Table 5.7.

(INSERT TABLE 5.7 HERE)

Heckman treatment model confirms our previous findings that the use of derivatives is associated with an increase in firm value of domestic firms and domestic MNCs with hedging premiums of 4.2% ($p < 0.1$), and 11.1% ($p < 0.1$), respectively. We notice that after controlling for self-selection bias, magnitude of value effect of derivatives use is higher than OLS estimation and it strongly supports findings of previous studies that domestic MNCs outperform domestic firms (e.g., Lin *et al.* 2009). We also find that firms in low corrupt countries are more valuable than those in highly corrupt countries, but home country's lower level of corruption favors domestic MNCs than domestics firms ($\beta_{Domestic\ MNCs} = 0.1186$, $p < 0.01$; $\beta_{domestic\ firms} = 0.0457$, p

<0.1). With regard to foreign affiliates, we find that derivatives use decreases firm value by 6.89%, although lower corruption level of host country rewards foreign affiliates with higher value ($\beta = 0.0077, p < 0.05$). These results are consistent with those findings reported from OLS estimation in table 5.4.

5.5.3.3. An additional test: Firm market value and derivatives use

Finally, we replicate OLS model with firm market value in thousand USD, which is defined as a firm's share price multiplied by the number of ordinary shares in issue, as an alternative proxy for Tobin's Q. The regression results are reported in the table 5.8.

(INSERT TABLE 5.8 HERE)

In the case of domestic firms and domestic MNCs, our primary explanatory variable – derivatives use – shows positive coefficients that are statistically significant ($\beta_{domestic\ firms} = 41.75, p < 0.1; \beta_{Domestic\ MNCs} = 48.32, p < 0.1$). It is consistent with our previous findings and hypothesis 1 that the use of derivatives enhances value of firms. Additionally, the coefficients of interaction terms between derivatives use and corruption show positive and significant results ($\beta_{domestic\ firms} = 0.472, p < 0.1; \beta_{Domestic\ MNCs} = 0.540, p < 0.1$), indicating that the home country's level of corruption related to value effect of derivatives use and those firms are more valuable in low corrupt countries.

In contrast, regarding foreign affiliates, we are unable to find any link between derivatives use and firm value, although it shows negative effect on firm value ($\beta = -99.82, p > 0.1$). The interaction term between derivatives usage and corruption, in addition, does not show a statistically significant result ($\beta = 1.613, p > 0.1$). Thus, our hypotheses are not supported.

However, the overall results of robustness tests altogether indicate that our main inferences are mostly robust to various estimation techniques and alternative proxy for firm value.

5.6. Conclusion

We explored the impacts of derivatives use on firm value of domestic firms, domestic MNCs and foreign affiliates under influence of corruption environment in eight East Asian countries during the period of 2003-2013 that encompasses the global financial crisis, thereby differing from previous works and contribute to the theoretical and empirical literature as below

The primary conceptual contribution of this study is to take an institution-based view of value effect of derivatives use. In particular, we apply the institutional theory and internationalization theory in IB to risk management in finance; we integrate country-level factors into research design and explain why and how value implication of derivatives use differs across firm types in light of home and host countries' corruption environment. It is because all East Asian firms are embedded in the corruption environment of home and/or host country, while firm-specific factors alone cannot fully explain firms' behaviors, so an analysis of the influence of corruption levels provides an additional perspective on the drivers of value effects of derivatives use. This study is one of the first to examine how institutional factor, i.e. corruption environment, and derivatives use jointly affect a firm value, which is a necessary and highly promising approach.

Our first empirical contribution is to find strong and significant evidence that low corruption level of home country rewards domestic firms and domestic MNCs with higher value (hedging premiums are from 9.87% to 11.77%, and 10.78% to 12.72% respectively). Although derivatives use always decreases firm value of foreign affiliates in all models, we also find that foreign affiliates are more valuable in host countries where corruption is less severe. These findings underline the importance of institutional incentives in encouraging value-enhancing derivative activities.

The other distinction of this study is that it compares impacts of derivatives use on firm value for different firm types to answer whether hedging activities of domestic MNCs perform better in terms of firm value than domestics firms and foreign affiliates; and what level of corruption in home or host country rewards firms with higher value. We notice that empirical results, even after controlling for endogeneity and self-selection bias, consistently support that domestic MNCs outperform domestic firms and foreign affiliates. We also find that home country's low corruption level favors domestic MNCs than domestics firms, while low corruption environment of host country enhances effect of derivatives use on foreign affiliates' firm value.

Furthermore, we shed new light on the current literature on corruption and provide new insights into firms' hedging activities when firms are affected by the global financial crisis. We observe that during the crisis, benefit of derivatives use does not gain, and the effect of low corruption levels on mitigating negative impacts of the crisis on derivatives usage is very moderate. However, we find strong link between the low corruption level of home country and hedging premiums of domestic firms and domestic MNCs in the post-crisis.

There are also practical implications of this study for firm managers and policy-regulators. The finding that firms using derivatives are more valuable in countries with low corruption levels particularly provides useful and practical insights to firms' managers to increase their firms' cash flows and firm value through derivative activities. Firm managers should not only include measures for firm-specific factors when determining hedging policy, but also for home/host country's corruption levels. On the other hand, these results clearly suggest that regulators or policy-makers want to foster performances of non-financial firms with hedging activities in a country, they should be more actively in cracking down corruption levels. Finally, due to

characteristics of our sample firms and sample countries, the results of this research can be applicable and easily generalized into any developing and developed countries in which there are non-financial firms using financial derivatives, and corruption exists.

Table 5.1: Descriptive statistics of derivatives use of sample firms

This table shows the number of firms and the percentage of firms that use derivatives by country, by derivative use information, and by year for all firms. We present the percentage of firms using any financial derivatives (foreign currency derivatives and/or interest rate derivatives and/or commodity price derivatives). Panel A presents the use of derivatives based on firm-year observations by country. Panel B reports the information about the use of derivatives by derivative users, non-users and notional value of derivatives contracts. Panel C shows the trend of derivatives use over time.

Panel A: Derivatives use by country

Countries	**Total**	**Any derivatives**	
	N	*N*	*%*
Indonesia	429	158	36.83
Philippines	352	352	100.00
Singapore	1639	651	39.72
Japan	1661	1661	100.00
Hong Kong	1606	382	23.79
Malaysia	1760	669	38.01
China	1111	179	16.11
Thailand	1133	1133	100.00
Total	9691	5185	53.50

Panel B: Firms' derivatives use information

	Observations	**Mean**	**Std. Dev.**
Any derivative dummy	9691	0.4903519	0.4999327
Notional value of any derivative	6070	339721.1	4300822

Panel C: Derivatives use by year

Years	**Total**	**Any derivatives**	
	N	*N*	*%*
2003-2006	3524	1752	49.72
2007-2008	881	477	54.14
2009-2013	4405	2462	55.89
Total	9691	5185	53.50

Table 5.2: Definitions of variables

This table defines the dependent and independent variables, and control variables that we examine

Variables	Definitions	Sources
Dependent variable		
Tobin's Q	(Book value of total assets - book value of equity + market value of equity) / book value of total assets (Natural logarithm)	Authors' calculation
Main independent variables		
USE	Derivative use intensity (notional value of derivatives contracts in thousand USD / total assets)	Authors' calculation
Corruption index	Corruption Perception Index (CPI): Inverse ranking of country corruption levels on a scale from 100 (very clean) to 0 (highly corrupt) (from Transparency International)	Transparency International
Control variables		
Firm size	Natural logarithm of market value of total assets scaled by Producer price index (PPI)	Datastream
Leverage	Total debt to total assets	Datastream
ROA	Return on assets (net income / book value of total assets)	Datastream
Capital expenditures	Market value of a firm's common equity divided by book value of common equity	Datastream
Quick ratio	(Cash + short-term investments) / total current liabilities	Datastream
Dividend yield	(Common dividend per share / fiscal year end share price)	Datastream
FORSALES	Foreign sales to total sales	Datastream
GEOMARKT	Dummy variable which has a value of one for firms that have sale markets in foreign countries, and zero otherwise	Authors' construction
Industrial diversification	Dummy variable which equals one for firms operating in more than one business segment in the SIC industry classification, and zero otherwise	Authors' construction
GDP per capita	Gross domestic products (GDP) / midyear population	World Bank
Financial system deposits to GDP	The demand, time, saving deposits in deposit money banks and other financial institutions as a share of GDP	World Bank

Table 5.3: Summary statistics: derivatives users versus non-users

This table presents a summary statistics of characteristics between firms using derivatives and those firms do not. Panel A reports summary statistics for the variables for the domestic firms that use either foreign currency derivatives, interest rate derivatives or commodity price derivatives (derivative users) and firms that do not (derivatives non-users). Panel B displays the mean, standard deviation for variables of domestic MNC only separately for derivatives users and non-users. Panel C presents these values for foreign affiliates only. *P*-values for testing the difference in means are also reported. Asterisks ***, **, and * indicate significance at the 1%, 5% and 10% level, respectively.

Varisables	**General derivatives use**				
	Users		Non-users		*p-value*
	Mean	Std.Dev	Mean	Std.Dev	
Panel A: Domestic firms					
Tobin's Q	0.509	0.557	0.418	2.067	0.0541*
Corruption index	61.277	21.091	60.65	19.685	0.3164
Firm size	5.7169	2.357	5.1739	2.060	0000***
Leverage	23.824	36.615	26.072	97.296	0.3092
ROA	5.752	12.976	6.460	84.848	0.6980
Capital expenditures	16.534	250.908	15.712	103.039	0.8919
Quick ratio	3.987	48.974	2.337	9.990	0.1417
Dividend yield	2.757	4.033	3.433	37.732	0.4008
FORSALES	42.566	36.835	41.147	41.150	0.3231
GEOMART	0.501	0.500	0.526	0.499	0.1247
Diversification indicator	0.404	0.491	0.386	0.487	0.2415
Financial system deposits to GDP	129.44	62.39	153.86	83.45	0.000***
Ln (GDP per capita)	38364	26320	39578	25122	0.0183**
Panel B: Domestic MNCs					
Tobin's Q	0.798	0.657	0.443	0.467	0.0004***
Corruption index	64.338	17.417	54.881	19.252	0.0000***
Firm size	7.013	2.376	5.686	2.257	0.0000***
Leverage	22.890	29.243	24.697	49.795	0.1371
ROA	5.888	16.213	5.275	36.569	0.4693
Capital expenditures	8.906	17.694	33.219	629.862	0.0704*
Quick ratio	3.983	81.245	2.518	29.299	0.4095
Dividend yield	2.324	4.783	2.424	3.132	0.3984
FORSALES	32.843	31.083	30.830	34.832	0.0906*
GEOMART	0.785	0.411	0.755	0.430	0.0183**
Diversification indicator	0.545	0.498	0.513	0.673	0.0688*
Financial system deposits to GDP	158.95	72.37	122.41	85.44	0.0000***
Ln(GDP per capita)	34824	18838	30202	22790	0.0000***
Panel C: Foreign affiliates					
Tobin's Q	0.702	0.397	0.715	0.322	0.0615*
Corruption index	55.556	18.651	58.028	16.625	0.0695*
Firm size	5.672	2.382	5.250	2.095	0.0497**
Leverage	24.466	26.385	33.699	236.710	0.4309
ROA	6.330	10.099	4.091	20.670	0.0584*
Capital expenditures	10.851	27.618	14.387	34.774	0.1349
Quick ratio	1.519	1.834	3.927	19.499	0.0136**
Dividend yield	3.974	26.894	2.322	2.749	0.3013
FORSALES	36.440	35.003	32.752	36.156	0.2453
GEOMART	0.621	0.486	0.684	0.466	0.0981*
Diversification indicator	0.330	0.471	0.487	0.500	0.0000***
Financial system deposits to GDP	147.55	83.39	159.88	93.41	0.0651*
Ln(GDP per capita)	30790	20418	33903	20114	0.0444**

Table 5.4: Firm value and derivatives use under influence of corruption environment

This table reports the effects of derivatives use on firm value from an OLS estimation split up with regard to domestic firms, domestic MNCs, and foreign affiliates. The dependent variable is Ln(Tobin's Q), which is calculated as the natural logarithm of book value of total assets minus book value of equity plus market value of equity over book value of total assets. Derivatives use is calculated as the notional value of any derivative contract in thousand USD (foreign currency, interest rate and commodity price derivatives) scaled by total assets. All other independent variables definitions are reported in Table 5.2. Standard errors are clustered by country to control for heteroscedasticity and serial correlation. *P*-values are in parentheses. Asterisks ***, **, and * indicate significance at the 1%, 5% and 10% level, respectively.

Variabless	**Domestic firms**	**Domestic MNCs**	**Foreign affiliates**
Derivative use	0.0418**	0.0494*	-0.0700***
	(0.029)	(0.057)	(0.000)
Derivative*corruption	0.0759***	0.0778**	0.0570***
	(0.003)	(0.018)	(0.001)
Corruption index	0.154*	0.0590***	0.0943
	(0.176)	(0.004)	(0.134)
Firm size	0.945***	0.202***	0.804***
	(0.000)	(0.001)	(0.001)
Leverage	0.0719**	0.0651*	-0.0906
	(0.019)	(0.081)	(0.112)
ROA	-0.0555**	-0.0360	-0.0492
	(0.029)	(0.626)	(0.745)
Capital expenditure	0.0307	0.0304**	-0.0885
	(0.242)	(0.015)	(0.836)
Quick ratio	-0.0612	-0.0264	-0.0119***
	(0.647)	(0.127)	(0.002)
Dividend yield	-0.0104	0.0306**	0.0149
	(0.577)	(0.014)	(0.256)
FORSALE	-0.0466*	0.0350	-0.0685
	(0.077)	(0.643)	(0.994)
GEOMART	-0.211	0.0335	0.0913
	(0.166)	(0.570)	(0.776)
Diversification indicator	-0.0566	-0.0578	-0.835**
	(0.747)	(0.289)	(0.013)
GDP per capita	0.0676	-0.6170	0.479**
	(0.967)	(0.188)	(0.010)
DEPOSITSTOGDP	0.0033	-0.0038*	0.0069
	(0.883)	(0.091)	(0.261)
Intercept	-2.915	3.472	-62.01***
	(0.812)	(0.422)	(0.002)
Country dummies	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
No of observations	1420	1431	272
R-square	0.413	0.367	0.533

Table 5.5: Value effects of derivatives use under corruption before, after, and during the global financial crisis

This table reports the effects of derivatives use on firm value before, after and during the global financial crisis from an OLS estimation split up with regard to domestic firms, domestic MNCs, and foreign affiliates. The dependent variable is Ln (Tobin's Q), which is calculated as the natural logarithm of book value of total assets minus book value of equity plus market value of equity over book value of total assets. Derivatives use is calculated as the notional value of any derivative contract in thousand USD (foreign currency, interest rate and commodity price derivatives) scaled by total assets. All other independent variables definitions are reported in Table 5.2. Standard errors are clustered by country to control for heteroscedasticity and serial correlation. *P*-values are in parentheses. Asterisks ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

Variables	Domestic firms			Domestic MNCs			Foreign affiliates		
	2003-2006	2007-2008	2009-2013	2003-2006	2007-2008	2009-2013	2003-2006	2007-2008	2009-2013
Derivative use	-0.0337***	-0.0749**	0.1245*	-0.0124	-0.1379*	0.0939**	-1.350	-0.134	-0.0951**
	(0.001)	(0.023)	(0.076)	(0.993)	(0.090)	(0.039)	(0.332)	(0.880)	(0.014)
Derivative*corruption	0.0154***	0.0014**	0.0285**	-0.0575	0.0038*	0.0167***	0.0091	0.0795	0.0106**
	(0.001)	(0.013)	(0.034)	(0.737)	(0.087)	(0.008)	(0.645)	(0.885)	(0.015)
Corruption index	-0.0357	-0.0308	0.554**	-0.139	0.239	0.148***	0.100	-0.514	0.0334
	(0.203)	(0.813)	(0.035)	(0.617)	(0.527)	(0.001)	(0.783)	(0.884)	(0.829)
Firm size	0.969***	0.894***	0.962***	0.885***	0.799***	0.826***	0.749***	0.7220	0.865***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.267)	(0.000)
Leverage	0.00331	-0.00398	-0.00647	0.0063**	0.0055	-0.0038	-0.0018	-0.0681	-0.0398
	(0.184)	(0.633)	(0.908)	(0.021)	(0.512)	(0.410)	(0.273)	(0.990)	(0.362)
ROA	-0.00413**	-0.0186	-0.0069***	0.0133	0.0278	-0.0043	-0.0106	-0.0384	0.0049
	(0.024)	(0.152)	(0.010)	(0.277)	(0.206)	(0.366)	(0.831)	(0.849)	(0.637)
Capital expenditure	0.00393	-0.0173***	0.0028	0.0062**	-0.0025	0.00478***	0.0271**	-0.0099	0.0047
	(0.162)	(0.010)	(0.308)	(0.029)	(0.772)	(0.002)	(0.041)	(0.682)	(0.291)
Quick ratio	-0.00957	-0.0617*	0.0394**	0.0366	0.0117	0.0401	-0.0286	0.106	-0.0109***
	(0.220)	(0.063)	(0.039)	(0.463)	(0.442)	(0.161)	(0.311)	(0.619)	(0.001)
Dividend yield	-0.0633***	0.0238	0.00176	-0.0135	-0.0021	0.0209	0.00958	0.216	-0.0144
	(0.003)	(0.742)	(0.916)	(0.819)	(0.969)	(0.266)	(0.575)	(0.462)	(0.795)
FORSALE	0.0098*	0.0047*	0.0026	0.0041	0.0064	-0.0029	0.0104	0.0197	0.0036***
	(0.056)	(0.085)	(0.206)	(0.385)	(0.414)	(0.134)	(0.656)	(0.616)	(0.007)
GEOMART	-0.149	0.0847	-0.187	-0.155	0.432	-0.111	0.236	-0.112	-0.493
	(0.311)	(0.682)	(0.279)	(0.500)	(0.343)	(0.536)	(0.623)	(0.970)	(0.477)
Diversification indicator	-0.109	0.0825	-0.0902	-0.204	-0.133	-0.228	-0.1006***	0.3981	-0.727**
	(0.518)	(0.676)	(0.645)	(0.262)	(0.432)	(0.227)	(0.004)	(0.774)	(0.026)
GDP per capita	-0.612	0.885	0.818	-0.796	0.7168	-0.9273	0.3738	0.2635	0.6566
	(0.248)	(0.653)	(0.463)	(0.757)	(0.289)	(0.324)	(0.790)	(0.846)	(0.417)
DEPOSITSTOGDP	0.0017	-0.0082	-0.0016	-0.0232	-0.0567	-0.0019	-0.0019	-0.186	0.0011
	(0.924)	(0.824)	(0.977)	(0.261)	(0.272)	(0.828)	(0.981)	(0.837)	(0.975)
Intercept	-1.769	-31.94	-6.455	6.133	-89.32	-3.007	-45.76	-224.2	-69.96
	(0.697)	(0.562)	(0.695)	(0.836)	(0.230)	(0.726)	(0.687)	(0.837)	(0.305)
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No of observations	571	191	1063	496	230	1248	99	38	207
R-square	0.593	0.682	0.613	0.509	0.588	0.687	0.864	0.932	0.720

Table 5.6: Instrumental variable (IV) model

This table presents the impacts of derivatives use on firm value from an instrumental variable model (IV) split up with regard to domestic firms, domestic MNCs, and foreign affiliates. The dependent variable is Ln (Tobin's Q), which is calculated as the natural logarithm of book value of total assets minus book value of equity plus market value of equity over book value of total assets. Derivatives use is calculated as the notional value of any derivative contract in thousand USD (foreign currency, interest rate and commodity price derivatives) scaled by total assets. All other independent variables definitions are reported in Table 5.2. Standard errors are clustered by country to control for heteroscedasticity and serial correlation. *P*-values are in parentheses. Asterisks ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

Variables	**Domestic firms**	**Domestic MNCs**	**Foreign affiliates**
Derivative use	0.0371*	0.0733***	-0.0528***
	(0.076)	(0.000)	(0.000)
Derivative*corruption	0.0429*	0.1203***	0.0610***
	(0.080)	(0.000)	(0.000)
Corruption index	0.0157	0.0440***	-0.0707***
	(0.256)	(0.000)	(0.001)
Firm size	0.232***	0.295***	0.298**
	(0.000)	(0.000)	(0.044)
Leverage	0.0065*	0.0110**	0.0265***
	(0.076)	(0.020)	(0.001)
ROA	-0.0073***	-0.0204***	-0.0214
	(0.000)	(0.000)	(0.101)
Capital expenditure	0.0056	0.0016	-0.0097**
	(0.400)	(0.128)	(0.023)
Quick ratio	-0.0519**	-0.0114	-0.0240***
	(0.012)	(0.317)	(0.000)
Dividend yield	-0.0021	0.0078	0.0011
	(0.823)	(0.576)	(0.140)
FORSALE	0.0017	-0.0078	0.0055
	(0.896)	(0.652)	(0.226)
GEOMART	-0.0521	0.0721*	-0.504***
	(0.714)	(0.087)	(0.009)
Diversification indicator	0.162	0.181	0.145
	(0.137)	(0.443)	(0.208)
GDP per capita	-0.109	0.685**	0.638
	(0.763)	(0.010)	(0.145)
DEPOSITSTOGDP	0.0063	0.0084	0.0055***
	(0.402)	(0.265)	(0.002)
Intercept	1.021	-5.383**	-4.051
	(0.729)	(0.021)	(0.254)
Country dummies	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Kleibergen-Paap Wald rk F statistic	39.538	164.916	38.700
Kleibergen-Paap rk LM statistic (p-value)	0.0044	0.0031	0.0057
No of observations	1275	1005	174
R-square	0.512	0.682	0.485

Table 5.7: Heckman treatment model

This table presents the impacts of derivatives use on firm value from a Heckman treatment model split up with regard to domestic firms, domestic MNCs, and foreign affiliates. The dependent variable is Ln (Tobin's Q), which is calculated as the natural logarithm of book value of total assets minus book value of equity plus market value of equity over book value of total assets. Derivatives use is calculated as the notional value of any derivative contract in thousand USD (foreign currency, interest rate and commodity price derivatives) scaled by total assets. All other independent variables definitions are reported in Table 5.2. Standard errors are clustered by country to control for heteroscedasticity and serial correlation. *P*-values are in parentheses. Asterisks ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

Variables	Domestic firms	Domestic MNCs	Foreign affiliates
Derivative use	0.0422*	0.1110***	-0.0689**
	(0.071)	(0.000)	(0.018)
Derivative*corruption	0.0457*	0.1186***	0.0077**
	(0.054)	(0.000)	(0.023)
Corruption index	0.0579	0.0160*	-0.0924
	(0.798)	(0.072)	(0.614)
Firm size	0.935***	0.142***	0.712***
	(0.000)	(0.000)	(0.000)
Leverage	0.0041	0.0022*	0.0124
	(0.408)	(0.084)	(0.160)
ROA	0.0236*	-0.0128***	0.0377
	(0.064)	(0.000)	(0.235)
Capital expenditure	0.0047	-0.0074	-0.0375*
	(0.169)	(0.731)	(0.078)
Quick ratio	-0.0033	-0.0736***	0.521***
	(0.916)	(0.000)	(0.002)
Dividend yield	-0.0347	0.0252***	-0.0019
	(0.264)	(0.006)	(0.535)
FORSALE	-0.0017	-0.0012**	-0.0044
	(0.472)	(0.048)	(0.512)
GEOMART	0.212	-0.0322	0.0011
	(0.141)	(0.357)	(0.997)
Diversification indicator	-0.1618	-0.7673	-0.1763***
	(0.286)	(0.633)	(0.000)
GDP per capita	-0.0057	0.0032	-0.0765***
	(0.961)	(0.325)	(0.000)
DEPOSITSTOGDP	47.70	6.581	-161.1***
	(0.392)	(0.678)	(0.000)
Intercept	-0.335	-0.317**	0.550
	(0.620)	(0.047)	(0.393)
Country dummies	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
No of observations	1086	1405	202
Mills ratio	0.422*	0.1110***	-0.2689**

Table 5.8: Firm market value and derivatives usage under corruption

This table presents the impacts of derivatives use on firm market value from an OLS estimation split up with regard to domestic firms, domestic MNCs, and foreign affiliates. The dependent variable is firm market value in thousand USD, which is calculated as a firm's share price multiplied by the number of ordinary shares in use of that firm. Derivatives use is calculated as the notional value of any derivative contract in thousand USD (foreign currency, interest rate and commodity price derivatives) scaled by total assets. All other independent variables definitions are reported in Table 5.2. Standard errors are clustered by country to control for heteroscedasticity and serial correlation. *P*-values are in parentheses. Asterisks ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

Variables	Domestic firms	Domestic MNCs	Foreign affiliates
Derivative use	41.75*	48.32*	-99.82
	(0.079)	(0.054)	(0.233)
Derivative*corruption	0.472*	0.540*	1.613
	(0.086)	(0.061)	(0.133)
Corruption index	24.34	37.87***	107.6***
	(0.351)	(0.001)	(0.000)
Firm size	709.7***	801.4***	706.9***
	(0.000)	(0.000)	(0.000)
Leverage	1.018*	-0.0811	3.963
	(0.074)	(0.929)	(0.195)
ROA	0.0548**	0.352	0.752
	(0.023)	(0.197)	(0.931)
Capital expenditure	0.0401	0.0395***	0.292
	(0.547)	(0.001)	(0.874)
Quick ratio	1.291***	0.244	1.128***
	(0.006)	(0.971)	(0.008)
Dividend yield	6.799*	9.400	-1.526***
	(0.093)	(0.265)	(0.003)
FORSALE	-0.0047	-0.579	0.0236
	(0.991)	(0.593)	(0.984)
GEOMART	53.70	-20.64	-50.66
	(0.144)	(0.675)	(0.499)
Diversification indicator	-22.28	2.899	70.66
	(0.340)	(0.899)	(0.327)
GDP per capita	-2001.2**	363.2	-1147.7
	(0.015)	(0.427)	(0.235)
DEPOSITSTOGDP	-2.695***	1.892	-2.909
	(0.006)	(0.538)	(0.451)
Intercept	17605.2**	-2325.1	14983.8
	(0.017)	(0.581)	(0.117)
Country dummies	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
No of observations	1472	1573	290
R-square	0.797	0.830	0.831

CHAPTER 6

EMPIRICAL ANALYSIS OF ASSOCIATION BETWEEN DERIVATIVES USE AND EXPOSURES

6.1. Introduction

For the past decades, the strong development of financial derivatives as the most cost-effective instrument to manage market risks has aroused substantial interests of researchers to empirically investigate firms' hedging behaviors. However, while the determinants of derivatives use have been relatively thoroughly investigated on both theoretical and empirical aspects, the impact of financial derivatives use on firms' exposures has only recently become a subject for empirical analysis, and the research remains occasional.

Specifically, most of previous studies focus on exchange rate exposure and provide unclear-cut evidence on the relationship with derivatives use (e.g., Allayannis and Ofek, 2001; Choi and Jiang, 2009; Yip and Nguyen, 2012), while interest rate exposure is not examined in-depth. As a matter of fact, empirical research in East Asia context is very rare[22], although firms in East Asian countries have been increasingly using derivatives to manage risks over the last decades[23]. The

[22] To the best of our knowledge, up to date there is only study by Ameer, Matisa, and Abdullah (2011) directly investigating the link between derivatives use and exchange rate exposure for a sample of 60 Malaysian firms in Malaysia from 2007 to 2008.

[23] Accoring to the annual survey of the Future Industry Association, in 2015, the derivative trading volume of those firms account for about one-third of global volume

question whether the use of derivatives among non-financial firms in these countries reduces exposures to market risks, therefore, becomes a great interest.

Building upon the gaps in the existing literature, we explore the unique link between derivatives use and exposures to country risks, exchange rate, and interest rate risks by comparing domestic firms, domestic MNCs and foreign affiliates from different aspects of exposures with new hand-collected dataset of derivatives use of 881 non-financial firms from 8 East Asian countries for the period of 2003 to 2013. We make the following contributions.

First, while we have long learnt over the last decades about exposures to exchange rate, and sometimes interest rate exposures; to the best of our knowledge, the research linking derivatives use with exposure to country risks is nonexistent in the current literature. This is surprising as country risks have implications for taxation, spending, monetary and trade policy and industry regulation (Huang *et al.*, 2015; Glover and Levine, 2015), ultimately influence directly on firms' performances. Relatedly, country risks may have impacts on firm fundamentals such as investment opportunities, cash flows or risk-adjusted discount factors (Nonnenberg and Mendonca, 2004), leading to a possibility that firms may use derivatives to hedge exposures to country risks. Our study, therefore, aims to measure exposure to home (host) country risks and investigate a relationship between derivatives use and that type of exposure. In particular, we address the following question: ***Do non-financial firms use financial derivatives to reduce exposure to country risks?***

Second, most of earlier studies on exposures and derivatives use rule out domestic firms by explicitly focusing on MNCs simple because MNCs engage more in overseas operation and trade (see Bartov and Bodnar, 1994; Faff and Marshall, 2005). However, a purely domestic firm still is exposed to market risks, even exchange rate risk, if its competitor engages in international

business (Pantzalis, Simkins, and Laux, 2001; Choi and Jiang, 2009). Thus, whether MNCs are more exposed than domestic firms and other firms is not well understood. Relatedly, although the benefits of hedging from reducing exposures are well established, little has been done to investigate whether derivative activities of MNCs are associated with more significant reduced level of exposures than other firms. In this study, we propose that different firms have diverse objectives in managing risks, different views on the importance of various types of exposures, and those different hedging strategies determine how derivatives use influences level of exposures that firms face. Our study fully examines the link between derivatives use and exposures on the comparison of three types of firms (domestic firms, MNCs and foreign affiliates).

Furthermore, we investigate how effects of derivatives usage on exposures differ across domestic firms, domestic MNCs and foreign affiliates when they faced exogenous shocks caused by the global financial crisis of 2007-2008. Although there are numerous studies on that crisis, little has been done to analyze its impacts on derivatives use. Our study covers the 2003-2013 period, which provides a natural experiment of financial risks and risk management, to examine the dynamic of relationship between derivatives use and exposures before, during and after the crisis.

Third, although in recent years many interest rates exhibit as volatile as exchange rates, presenting a comparably important source of risk to firms as exchange rate risks, up to date there is a dearth of comprehensive studies on impacts of derivatives use on interest rate exposures. As a matter of fact, a large body of previous studies focuses on the link between derivatives usage and exchange rate exposure (e.g., Pantzalis *et al.,* 2001; Zhou and Wang, 2013; Hutson and Laing, 2014), while majority of studies on interest rate exposures has neglected the effects of

derivative use (e.g., Bartram, 2002). Additionally, while exposure to interest rate risks is a potentially considerable issue in corporate risk management not only for financial institutions but also for other firms, there is little attention to interest rate exposure of non-financial firms. Thus, in this study, we present comprehensive analysis of the link between derivatives use and interest rate exposure for a large sample of cross-country non-financial firms.

We summarize main findings of our study as follows. We provide a novel evidence that the use of financial derivatives by domestic firms and domestic MNCs significantly contribute to a reduction in exposure to home country risks by 11.4% and 13.4% per 1% increase in notional derivative holdings, respectively. We also find the outperformance of domestic MNCs in mitigating exposures compared to domestic firms and foreign affiliates. Domestic MNCs using foreign currency and interest rate derivatives experience 18.2% and 19.0% decline in exposures to exchange rate, and interest rate risks for each 1% increase in notional derivative holdings, respectively. Meanwhile, 1% increase in foreign currency and interest rate notional holdings of domestic firms contributes to 10.4% decrease in exchange rate exposure, and 11.8% in interest rate exposure. Notably, derivatives use of foreign affiliates is not effective in alleviating exposure to host country risks, and exchange rate risks, but is associated with 3.07% lower interest rate exposure. In addition, we notice that the financial crisis weakens the hedging benefit of derivative usage, and the effect of financial hedging on exposures in the post-crisis period, in general, is stronger than those in pre-crisis period.

The remainder of this study proceeds as below. Section 2 provides a review of current literature by discussing the relevance of exposures to exchange rate, interest rate risks to firms' hedging behaviors, country risks, and financial crisis. On that basis, we develop hypotheses regarding the association between derivatives use and exposures. Sections 3 and 4 describe the

sample, exposure estimation, model specifications, and information of variables. Empirical results are discussed in the section 5. Section 6 draws conclusion.

6.2. Theoretical framework and hypothesis

The use of derivatives and exposures

The increasing fluctuation of exchange rates, and interest rates create an additional source of uncertainty and risk, and ultimately affect profitability and value of firm. Hedging theory and risk management theories imply that if financial derivative contracts are value-enhancing instruments, then an increase in the use of derivatives in accordance with exposures to market risks should reduce individual exposure[24]. Thus, greater efforts in the use of derivatives may call forth smaller exposures if hedging activities are effective.

Economic theory implicates that all firms, from purely domestic firms to MNCs, are subject to exposures to exchange rate risk as their cash flows are affected by movement in exchange rates directly or indirectly (Heckman, 1985; Levi, 1994; Shapiro, 1975). The direct exposure refers to transaction exposure of expected future cash flows in foreign currencies, while the indirect exposure derives from the effect of changes in exchange rates on the competitiveness of the firm (i.e. from competitors, suppliers). Dumas (1978) and Hodder (1982) define exchange rate exposure as a regression coefficient of the value of a firm on exchange rate across states of nature.

Yet, the extant literature finds a puzzling relationship between exchange rate exposure and the use of financial derivatives. Many studies find that derivatives use is related to a significant reduction in exposure, but effects ranging from as low as 2.387% to as high as 54% (e.g., Adam

[24] A firm is subject to exposure to market risks if changes in market prices or indexes such as exchange rates, interest rates may negatively influence that firm's future cash flows and ultimately firm value.

and Fernando, 2006; Nguyen and Faff, 2010; Bartram, Brown, and Minton, 2010). Following Jorison (1990), Allyannis and Ofek (2001) apply the market model and find out a negative relationship between a firm's exchange rate exposure and its ratio of foreign currency derivatives intensity. In line with early studies, recent study by Zhou and Wang (2013) figure out that the use of foreign currency derivatives is effective in reducing firms' risk exposure to varied degrees. However, Li and Marinc (2014) find that derivatives use by bank holding companies in the U.S is associated with higher exchange rate exposure. Meanwhile, the arguments that firms use derivatives to hedge their exchange rate exposure and such usage efficiently reduce firm's exposures are questioned by some other empirical studies when they are unable to find any significant link (e.g., Choi and Jiang, 2009). Building upon the insights into theoretical arguments and empirical evidence, we propose the following hypothesis:

Hypothesis 7a: The use of foreign currency derivatives reduces exchange rate exposure

As for interest rate exposure, the discounted cash flow model of firm valuation predicts that an increase in interest rate exposure reduces the present value of future cash flow. This is because interest rate movements influence the investment behavior of a firm through cost of capital (Bartram, 2005), impact firms' financial assets and liabilities and ultimately share prices (Solnik, 1984). Given the theoretical expectation, it is interesting to examine a relationship between derivatives use and exposure to interest rate risks. Yet, that relationship has gained little attention in the existing literature. Nguyen and Faff (2010) provide mixed results. They report that among moderate derivative users with an extent of usage of less than 40%, the use of interest rate derivatives results in a risk reduction of approximately 2.387%. Yet, in the case of extensive derivative users, derivative use seems to increase firm risk. By contrast, Guay (1999) finds decline in interest rate exposure by 22% after the period of initiating interest rate derivative

positions. Relatedly, Gay, Lin, and Smith (2011), Brewer III, Deshmukh, and Opiela (2014) find a negative association between interest rate derivatives use and interest rate exposure.

We therefore propose that there is a negative relationship between the use of derivatives and interest rate exposure.

Hypothesis 7b: The use of interest rate derivatives reduces exposure to interest rate risk

Exposures to country risks and the use of derivatives

Shapiro (1999) defines country risk as a general level of political and economic uncertainty in a country influencing the value of investments in that country. Allien and Carletti (2013) further indicate that the interaction of institutions and markets determine country risk that drives firms' activities (Cantwell, Dunning, and Lundan, 2010). Relatedly, the important insights from Pástor and Veronesi (2012, 2013) is that policy-related uncertainty cannot be diversified away, and uncertainty is made up of a large fraction of risk premium, so it generally depresses asset prices by raising discount rate when the new policy is announced. Thus, it is reasonable to anticipate that derivatives use possible to influence exposure to country risks.

Indeed, based on argument of pecking order theory (Myers and Majluf, 1984), Durnev (2011) and Huang *et al.* (2015) argue that if information asymmetry is time-varying and stock prices become less informative during the time of high political uncertainty which is associated with uncertainty about future government policies, then firms' cost of external capital may increase in that period. This is because higher idiosyncratic and aggregate volatility increases the probability of distress and consequently increases the cost of external financing as Glover and Levine (2015) notice. On the other hand, uncertainty with respect to future economic policies makes managers less informed, they are less willing to base their decisions on the revealed information (Durnev, 2011), while Labmert, Leuz, and Verrecchia (2009) find that information

precision is a primary determinant of cost of capital. Regarding foreign affiliates, under the influence of host country's uncertainty, an increase in production of a MNC subsidiary decreases the production of other subsidiaries within the same MNC network (Lee and Song, 2012).

Although the literature on the political and economic uncertainty has been investigated extensively, both the economic theories and prior literature largely have been silent on the link between derivatives use and country risk. Batram *et al.* (2009) state that firms located in countries with greater economic, financial and political risks are more likely to use derivatives. On the other hand, firms based in less risky countries may have lower expected financial distress costs, and less need for risk management. Recently, Azad, Fang, and Hung (2012) find evidence that higher degree of economic, financial and political risks encourages firms to use derivatives more intensively.

Taken both literature on association between derivatives use and exposures, and theoretical and empirical studies on country risks together, our hypothesis is yielded as below:

Hypothesis 8: There is a negative relationship between the use of financial derivatives and exposure to country risk

Derivatives use and exposures for different firms

In the preceding sections, we hypothesize that there is a negative relationship between the use of financial derivatives and exposures. Yet, the use of financial derivatives does not have the same impact on exposures for different firm types. Institutional literature provides evidence that firms are not equally influenced by market and country risks. That heterogeneity derives from firms' differential resources, capabilities, and stock of experience in the same and or similar environment (Holburn and Zelner, 2010; Cuervo-Cazurra, 2011).

In particular, *such difference can be attributed to firm-specific advantages (FSAs)*[25]. Following internationalization theory (Buckley and Casson, 1976; Dunning, 1977), international business (IB) scholars have found that MNCs would be able to exploit cost differentials on a global scale due to operation cross borders (e.g., Allen and Pantzalis, 1996; Chung, Lee, Beamish, and Isobe, 2010). MNCs, by virtue of their global scope and strategy, and their ability to span both internal and external business networks across national boundaries (Scott-Kennel and Giroud, 2015), can have further advantages in hedging exposures to specific market or country risks. Financial researchers, additionally, point out one of the keys to success of MNCs is their advantages in accessing international capital markets and abilities to exploit market imperfections through internal capital markets or their networks of international subsidiaries (Park, Suh, and Yeung, 2013), thereby possibly overcoming such challenges as exchange rate fluctuations, transfer of capital limits set up by home/host countries' regulations, and potential double taxation. Thus, MNCs can achieve superior performance of hedging against market risks on their FSAs.

In comparison with domestic firms, central to the OLI paradigm (Dunning and Lundan, 2008) is the notion that by means of multinationality, MNCs have far greater opportunities than domestic firms to utilize a combination of organizational and external resources to spread the market risks and enhance performance. Most of early financial studies (e.g., Hughes, Logue, and Sweeney, 1975; Fatemi, 1984; Michel and Shaked, 1986) also evidence that internationalization is risk-reducing and MNCs have lower systematic risk, idiosyncratic risk and total risk vis-à-vis domestic firms. Consistently, in their analyses, Allayannis and Ofek (2001), Choi and Jiang

[25] FSAs are benefits and strengths specific to a firm as compared to rivals, such as management and administrative knowledge, know-hows, marketing, innovation (Rugman, 1981)

(2009) find that MNCs may possess superior capability for reducing exposures to market risks such as exchange rate risks by using financial derivatives. Dunning and Rugman (1985) further indicate that MNCs have greater degree of freedom than domestic firms restricted in one country. While domestic firms have to rely on limited financial instruments to hedge their exposures, MNCs have superior ability to engage in additional hedging tools (Pantzalis *et al.*, 2001).

Furthermore, IB literature emphasizes the importance of country-specific advantages (CSAs) such as economies of scale, access to natural resources in operation of MNCs and show that MNCs are better at exploiting CSAs than their domestic counterparts (Bhaumik, Driffied, and Zhou, 2016). These advantages increase competitive advantage of MNCs over domestic firms, and may attribute to a reduction in exposure to country and market risks that MNCs face. It is consistent with finding of Choi and Jiang (2009) that MNCs face smaller and less significant exchange rate exposures than non- MNCs.

In terms of foreign affiliates, recent IB and finance studies suggest that foreign affiliates tends to be at a disadvantage as they often suffer from liability of foreignness, in which they are likely to bear higher cost of capital, lower liquidity and less analyst coverage vis-à-vis local firms (Blass and Yafeh, 2001; Bell, Filatotchev, and Rasheed, 2012). Foreignness is usually associated with the issues such as foreign affiliates' lack of knowledge about local cultures and networks connecting them with important actors in host country's economy, and their weak link to local institutional setting (Zaheer, 2002; Bell, Filatotchev and Rasheed, 2012). Thus, it is reasonable to suggest that foreignness adds more difficulties in implementing derivatives activities for MNC subsidiaries than domestic firms and domestic MNCs.

Further, foreignness is largely determined by institutional distances between home and host countries referring to differences in regulatory, normative, and cultural-cognitive institutions of two countries (Salomon and Wu, 2012). This, in turn, increases foreign affiliates' cost of doing business in the host country (Riaz *et al.*, 2015). In particular, the inconsistencies in the decision- and law- making by a particular host country's regulatory institutions and governments increase variations in the immediate task environments of foreign affiliates (Khanna and Palepu, 1997), which possibly undermines implementation of derivative contracts. Additionally, by virtue of facing conflicting conformity pressures arising from regulations in the home country and policies of the parent company (Kostova and Zaheer, 1999; Kostova *et al.*, 2008) foreign affiliates bear additional costs from hedging exchange rate exposure[26].

From a different aspect, foreign affiliates could benefit from the access to a broad range of resources such as knowledge, networks, and knowhow due to diversity of the MNC as a whole. However, coordination, governance, and administrative costs may reduce the benefits or even make costs outweigh benefits (Khanna and Palepu, 2000), which eventually potentially increases hedging costs and dampens the effectiveness of derivative activities. Furthermore, Andersson, Forsgren, and Holm (2002) show that external embeddedness is not always in the best interest of the entire MNC, as it may alleviate incentives of subsidiaries to contribute to performance of MNCs (Oehmichen and Puck, 2016). As such, it possibly reduces the effect of foreign affiliates' derivative activities in hedging exposure to host country risks.

[26] For example, financial reporting could be structured conforming to home country's law and codes or by the parent company in order to have consistency across subsidiaries in different countries, although the law and regulations in host countries may not warrant them, thereby increasing governance and monitoring cost associated with hedging exchange rate exposure, more especially translation exposure.

In all, based on the extant research in the realm of domestic MNCs, domestic firms, and foreign affiliates, and on the arguments developed above, we hypothesize the following:

Hypothesis 9: The use of derivatives by domestic MNCs decreases a larger magnitude of exposure than domestic firms and foreign affiliates

Financial crisis, exposures, and derivatives usage

Finally, we analyze impact of the global financial crisis (2007-2008) on the relationship between derivatives use and exposures. It has been well established that there are two separate and sequential effects of a crisis on firms. On the one hand, a crisis brings about serious consequences, particularly turbulence in the foreign exchange and capital markets, with a rapid reduction in value and international transactions of major currencies, and exacerbated volatility of interest rates (Dufrénot and Keddad, 2014; Caporale, Hunter, and Ali, 2014), as well as increased risks for firms operating globally (Horta, 2013). Likewise, Patti and Sette (2016) evidence that the tightening capital supply of banks to non-financial firms during the financial crisis period translated into lower credit growth, lower probability of approving loan applications, and higher level of exchange rate fluctuation. Overall, this leads to a sharp rise in exposures to interest rate and exchange rate risks that non-financial firms face during crisis. On the other hand, firms restructure to adjust to a new environment and to reduce risk exposures after the crisis. Therefore, we theorize that effect of derivatives use on exposures is likely to be worse during the crisis period, but it is better in post-crisis period.

The logic of this argument, additionally, is based on the view that facing sudden and major external shocks, firms have difficulty in adjusting their risk management activities to mitigate contagion risks during a crisis period (Syriopoulos, Makram, and Boubaker, 2015). The benefits of hedging behavior may not gain during this period as the crisis results in significant exchange

rate fluctuations, rapid increase in financial costs and prices (Singh and Yip, 2000), and in risks of financial derivatives (Li and Marinc, 2014)[27]. Furthermore, firms with more complicated organizational structures will get into greater difficulties when big shock occurs (Hanna, Polos, and Carroll, 2003; Chakrabarti *et al.*, 2007). As a result, those difficulties increase hedging costs, eventually impede benefits of derivatives use in hedging exposures.

Building upon all arguments above, we predict:

Hypothesis 10a: The global financial crisis weakens the relationship between derivatives usage and exposures.

Hypothesis 10b: Derivatives use is negatively related to exposures in the post-crisis period

6.3. Sample and descriptive statistics

Our sample consists of 9691 firm-year observations; it is balanced panel data set of 881 non-financial firms across 34 different industries in 8 countries in East Asia, namely China, Hong Kong, Japan, Singapore, Malaysia, Thailand, Philippines, and Indonesia over the period of 2003-2013. We exclude financial firms, as they are likely to have different incentives for using derivatives than non-financial firms.

All data set on derivatives contracts is hand-collected. We strived to verify the data accuracy by searching through a subset of firms' annual reports, or from Morningstar [28], an independent

[27] According to the report on Implementing OTC Derivatives Market Reforms in 2010 of the Financial Stability Board, the global financial crisis of 2007-2008 presented the potential for contagion deriving from the interconnectedness of OTC derivatives market participants and the limited transparency of counterparty relationships (pp.1)

[28] http://quote.morningstar.com/stock-filing/Annual-Report/

investment research, which provides a direct link to each company's annual reports, or from Stock exchanges of each country. As eight countries in our sample have different local currencies with different values, it could have resulted in sampling bias. Hence, we decided to use a common currency for the amount of derivatives use and all other financial data and we chose the United States dollars (USD). For annual reports in which reporting currency is not USD, all hand-collected data are converted into USD using exchange rates on the Datastream database.

We augmented this database on derivatives usage from annual reports with financial data on control variables from the Datastream database. For data not available on Datastream, we searched annual reports of firms to fill in as much missing data as possible. Some country specific data such as country risks are obtained from the Economist Intelligence Unit, while proxies for economy and financial system development are obtained from the World Bank's World Development Indicators. All financial data are yearly and in thousand of USD.

In the sample, 389 domestic firms, 427 domestic MNCs and 65 foreign affiliates are identified. We use Corporate Affiliations database to classify firm types. Following Pantzalis, Simkins, and Laux (2001), we consider firm as a domestic MNC, if that firm has at least one majority owned foreign subsidiary, otherwise it is domestic firm. Foreign affiliate is defined as an independent organizational unit, which is located in any sample country, wholly or partially managed and controlled by a foreign parent MNC.

Summary statistics on the use of derivatives by the sample firms is reported in the table 7.1. Across all countries, approximately 53.5% of our sample observations use at least one type of derivatives, while usage rate in Japan, Philippines or Thailand is 100%, indicating that the use of derivatives is common among non-financial firms in East Asian countries. Firms using foreign

currency derivatives account for 42.55%, while 2495 firm-observations are using interest rate derivatives.

(INSERT TABLE 6.1 HERE)

In Panel B, we present the information about the use of particular types of financial derivatives for both derivative users and non-users. Our sample has a mean value of foreign currency derivative contracts is about $245.11 million, and the average notional amount of interest rate derivatives is $328 million. These numbers speak themselves that while foreign currency derivatives are the most commonly used instruments; non-financial firms in East Asian countries use interest rate derivative contracts with greater value for hedging purposes.

Panel C exhibits the trend of derivatives use across the entire sample firm over time. There is obvious change in the use of derivatives before and after the global financial crisis of 2007-2008. In particular, derivatives usage increase remarkably after 2009 in response to the crisis, which is shown by the number of foreign currency derivatives users in post-crisis period is 46.08% compared to 36.71% in the pre-crisis period.

6.4. Models for investigating association between the use of derivatives and exposures, and variable construction

6.4.1. Measuring dependent variables and empirical specifications

In this paper, we apply the two-stage approach, which is similar to recent papers in this area (e.g., Allayannis and Ofek, 2001; Clark and Mefteh, 2011; Zhou and Wang, 2013; Berghofer and Lucey, 2014). The dependent variables are exposures to country risks, exchange rate risk, and interest rate risk, i.e. the coefficients that are estimated by the market model[29] in the first stage.

[29] Market model is developed by Adler and Dumas (1984), and augmented by Jorion (1990)

In the second stage, we conduct econometric regressions with the exposure coefficients estimated in the first stage as the dependent variables.

6.4.1.1. Stage one: Exposure estimation

We use the total monthly sample from January 2003 to December 2013 to estimate augmented market model (cross-sectional) regressions including returns on country risks, exchange rates, and interest rates[30]. For individual firms, we calculate stock returns in USD, the USD returns of corresponding national stock market index, the percentage change in trade weighted effective exchange rate (in local currency relative to one unit of USD), interest rates and country risks. We use 1 year Interbank offered rate, which is compounded monthly, in each country obtained from Datastream as proxy for interest rate. We use the average scores for sovereign risk, currency risk, banking sector risk, and economic structure risk of each country on a scale from 0 (minimum risk) to 100 (maximum risk), which is obtained from the Economist Intelligence Unit to measure country risk. In particular, we estimate for each firm in the following equations:

$$R_{ijt} = \beta_{0i} + \beta_{1ijt}R_{mjt} + \beta_{2ijt}CR_{jt} + \varepsilon_{ijt} \quad (6.1)$$

$$R_{ijt} = \alpha_{0i} + \alpha_{1ijt}R_{mjt} + \beta_{3ijt}FX_{jt} + \varepsilon_{ijt} \quad (6.2)$$

$$R_{ijt} = \gamma_{0i} + \gamma_{1ijt}R_{mjt} + \beta_{4ijt}IR_{jt} + \varepsilon_{ijt} \quad (6.3)$$

$$i = 1,..,n;\ j = 1 - 8,\ t = 1,..,k$$

Where:

R_{ijt}: The rate of return on stock of firm i located in country j in period t

R_{mjt}: The rate of return on country j's benchmark stock index in period t

CR_{jt}: The rate of change in country j's overall risk index in period t

[30] Daily and wekly data is noisier and usually are afflicted by nonsynchroneity problems (Allayannis and Ofek, 2001)

FX_{jt}: The rate of change in trade weighted effective exchange rate in country *j* in period *t*

IR_{jt}: The rate of change in Interbank offered rate in country *j* in period *t*

β_{2ijt}: Exposure to country risk of firm *i* located in country *j* in period *t*

β_{3ijt}: Exchange rate exposure of firm *i* located in country *j* in period *t*

β_{4ijt}: Interest rate exposure of firm *i* located in country *j* in period *t*

ε_{itt}: Error term clustered by country

The coefficients β_{2ijt}, β_{3ijt}, and β_{4ijt} represent exposures to country risks, exchange rate, and interest rate, respectively. The exposure to exchange rate measures the percentage change in the rate of return on a firm's common stock against a 1% change in the exchange rate (Allayannis, and Ofek, 2001). Similar to the exchange rate exposure, the exposure to country risk and to interest rate measures the percentage change in the rate of return on a firm's common stock against a 1% change in country risks, and 1% change in the interest rate, respectively.

6.4.1.2. Stage two: Model estimated exposures

In the second stage, potential effects of firms' derivatives use on exposure to country risks, and impacts of the use of specific derivative types on equivalent exposures will be investigated. In particular, absolute values of the estimated exposure coefficients in the equations (6.1), (6.2), (6.3) act as dependent variables in multivariate analysis[31]. In testing the above stated hypotheses, our baseline models can be written in condensed forms in equations (6.4), (6.5), and (6.6) as below

[31] In the multivariate tests, we use absolute rather than actual estimated exposures because the sign of exposures just measures the direction of risk exposures, while the magnitude of exposures are more important (Faff and Marshall, 2005)

$$|\widehat{\boldsymbol{\beta}}_{2ijt}| = \alpha_0 + \alpha_1 DER_{ijt} + \sum_{t=1}^{k} \boldsymbol{\alpha} \boldsymbol{V_{ijt}} + \varepsilon_{ijt} \quad (6.4)$$

$$|\widehat{\boldsymbol{\beta}}_{3ijt}| = \gamma_0 + \gamma_1 FCD_{ijt} + \sum_{t=1}^{k} \boldsymbol{\gamma_j X_{ijt}} + \varepsilon_{ijt} \quad (6.5)$$

$$|\widehat{\boldsymbol{\beta}}_{4ijt}| = \theta_0 + \theta_1 IRD_{ijt} + \sum_{t=1}^{k} \boldsymbol{\theta_t Y_{ijt}} + \varepsilon_{ijt} \quad (6.6)$$

i =1…n, j = 1- 8, t = 2003-2013

Where:

$|\widehat{\boldsymbol{\beta}}_{2ijt}|$, $|\widehat{\boldsymbol{\beta}}_{3ijt}|$, $|\widehat{\boldsymbol{\beta}}_{4ijt}|$: Absolute values of exposures to country risks, exchange rate risks, and interest rate risks estimated from equations (6.1), (6.2), and (6.3) of firm *i* located in country *j* in year *t*, respectively

DER_{ijt}, FCD_{ijt}, IRD_{ijt}: General derivative, foreign currency, interest rate derivative intensity of firm *i* located in country *j* in year *t*, measured by notional amount of derivative contracts scaled by total assets, respectively

V_{ijt}, X_{ijt}, Y_{ijt}: Vector of firm- and country-specific variables in year *t*, including operational hedging, international involvement, firm size, leverage, and country-level variables (GDP per capita, financial system deposits to GDP, and rule of law)

ε_{ijt}: Error terms clustered by country

In our initial tests, we use pooled regression model for equations from (6.4) to (6.6) with the subsamples of domestic firms, domestic MNCs, and foreign affiliates. To control for unobserved time-varying effects and measure within-country and within-industry differences in the effect of derivatives use on exposures, we use country, industry and year dummies. Furthermore, it is likely that standard errors are inflated due to dependence at the firm level at a pooled cross-section regression, so we employ clustering method, which is developed by Rogers (1993) to adjust for heteroscedasticity and serial correlation of standard errors.

We then assess robustness of our results by carrying out additional investigations. First, we acknowledge that the observed relationship is possible to be subject to endogeneity. To address this concern, we implement instrumental variable (IV) model. Second, we carry out panel data regressions with random effect specification to estimate equations from 6.4 to 6.6. Although the regression results from both fixed effect and random effect specifications are comparable, the Hausman (1978) test shows a preference for the random effect model over the fixed effect model.

6.4.2. Independent variable – the use of derivatives

Berkman and Bradbury (1996) state that the ideal measure of derivative usage is hedging ratio of contracts being used for managing risk. According to this argument, we measure hedging activity by derivative intensity rather than derivative dummy variable as this method provides a direct view about effect of derivatives usage on exposures. Following prior studies (e.g. Aabo and Ploeen, 2014; Lievenbruck and Schmid, 2014) we limit ourselves to analysis of notional values as in general fair values do not reflect the amount that has been secured through a contract.

We then construct derivative intensity by using notional amount of derivatives scaled by firm size. Consistent with the literature, we use the natural logarithm of book value of total assets to proxy for firm size (e.g., Allayannis and Ofek, 2001; Guay and Kothari, 2003; Lievenbruck and Schmid, 2014). In case a firm is not considered a derivative user, we set the notional derivative value to zero. This derivative intensity is censored at zero by construction. Further, in this study, we classify derivatives by underlying assets and investigate general derivatives use including foreign currency, interest rate, and commodity price derivatives, and two specific types: foreign currency, and interest rate derivatives.

6.4.3. Control variables

1. Operational hedging: Empirical research documents that many firms actively manage exposures to market risks though the use of operational hedging (e.g., Choi and Jiang, 2009; Pantzalis *et al.,* 2001; Berghofer and Lucey, 2014), as Pantzalis *et al.* (2001) argue that operating exchange rate exposure could be best managed by operational hedging. Taking into consideration of the extensive use of operational hedging and its potential effects on exposures, it is necessary to control for operational hedging in trying to understand firms' exposures. In this study, we use dummy variable GEOMARKT, which has a value of one for firms that have sale markets in foreign countries, and zero otherwise, as a measure for geographic diversification. In addition, we control for effect of industrial diversification on exposures by using diversification dummy, which equals one for firms operating in more than one business segment in the SIC industry classification, and zero otherwise.

2. International involvement: It is well established in the existing literature that foreign sale ratios are important determinants of exposures (Jorion, 1990; Bodnar and Wong, 2000; Allayannis and Ofek, 2001) as they indicate that firms with large proportion of foreign sales tend to be more exposed to market risks. Following Allayannis and Ofek (2001), we use the ratio of foreign sales to total sales, denoted as FORSALES, to measure a firm's degree of international involvement in this study. We expect that it is positively associated to exposures.

(INSERT TABLE 6.2 HERE)

3. Firm size: Previous studies have identified that smaller firms are more subject to market risk exposures than larger firms (Pantzalis *et al.,* 2001; Choi and Jiang, 2009; Hutson and Stevenon, 2010). Early studies (e.g., Nance, Smith, and Smithson, 1993; Géczy, Minton, and Schrand, 1997) argue that larger firms are more likely to use derivatives because of economies of

scale. Recent empirical studies find that firms operating across more countries face less exchange exposure (Pantzalis *et al.,* 2001), and MNCs are associated with smaller and less significant exchange rate exposures than non-MNCs (Choi and Jiang, 2009). Therefore, we use the natural logarithm of book value of total assets as a proxy for firm size, and expect a negative effect for firm size.

4. Leverage: The extent to which a firm is exposed to market risks has been shown to depend on leverage (He and Ng, 1998). There are at least two reasons for it. First, highly levered firms have more incentive to use derivatives, because the use of derivatives reduces expected financial distress and bankruptcy costs (Smith and Stulz, 1985; Froot, Scharfstein, and Stein, 1993). Second, He and Ng (1998) find that a firm with high leverage ratio tends to have smaller exposures. We therefore use the ratio of total debts to total assets as our definition of leverage and hypothesize a negative relationship between leverage and exposures.

5. Country-level control variables: We control for country effects and country's time invariant characteristics by using GDP per capita to proxy for relative performance of the countries, and financial system deposits to GDP, which is defined as demand, time, saving deposits in deposit money banks and other financial institutions as a share of GDP, to proxy for financial market development. These variables are obtained from the World Bank's World Development Indicators. An increase in GDP per capita and financial system deposits to GDP gestures growth in the economy and tends to signal a reduction in market risks. Thus, a negative relationship between exposures and these variables is expected. Additionally, Hutson and Stevenon (2010) find a significant negative link between a firm's exposure and the extent of creditor protection in the country where firms are operating. Thus, we use rule of law, which

measures the quality of law enforcement, to proxy for country-governance quality. It is retrieved from the World Bank's Worldwide Governance Indicators.

6.5. Empirical results and analysis

6.5.1. Univariate results

Table 6.3 displays the benchmark exposure estimation of equations (6.1), (6.2), (6.3) and summary statistics for the data used in this study, divided by domestic firms (panel A), domestic MNCs (panel B), and foreign affiliates (panel C) in accordance with the classification discussed above. While the results in table 6.3 only present general derivatives, the tests also are implemented separately for foreign currency derivatives, and interest rate derivatives, and differences are mentioned in the text where appropriate.

(INSERT TABLE 6.3 HERE)

In this section, our first interest is comparing the estimated exposures to country risks, exchange rate, and interest rate risks that each type of firm faces. The means of exposure coefficients reported in the second column show that domestic firms have the highest overall exposures, while domestic MNCs have smaller exposures than domestic firms and foreign affiliates. In particular, the average exposure to country risks $|\widehat{\boldsymbol{\beta}}_{2ijt}|$ of domestic MNCs is approximately 25% lower than domestic firms, and about 8% lower than foreign affiliates. Likewise, exchange rate and interest rate exposures are smaller and less significant for domestic MNCs than other firms. The averages $|\widehat{\boldsymbol{\beta}}_{3ijt}|$ and $|\widehat{\boldsymbol{\beta}}_{4ijt}|$ of domestic MNCs are 48.47% and 38.95% lower than domestic firms, while they are 33.85% and 74.31%, respectively, lower than foreign affiliates. These results provide some support for the Hypothesis 9, and are consistent with Choi and Jiang (2009), and Hutson and Laing (2014), who found that MNCs have lower levels of exchange rate exposure than non-multinational firms.

We then investigate whether the use of derivatives is associated with a reduction in exposures by running t-test for differences in means of estimated exposures for derivative users and non-users. For domestic firms, as expected, the panel A shows that derivative users have lower average exposure to country risks than non-users (0.1484 versus 0.2004). This, however, is not statistically significant at any standard level. Yet, we observe that derivative users have both lower average exposures to exchange rate and interest rate risks than non-users (0.2012 versus 0.3442, and 0.5604 versus 0.9068), and the mean differences are both significant ($p<0.05$, and $p<0.01$).

For domestic MNCs, the results indicate that derivative users have lower overall exposures than non-users – as expected. All exposures of derivatives users represent lower relative to non-users, and statistically significant differences in means at standard level. Similarly, for foreign affiliates, derivative users have lower exposures to country risks and interest rate risks than non-users. A rather unexpected finding is that derivative users have higher exchange rate exposure than non-users. The mean difference, however, is not significant at standard levels. Thus, on a univariate basis, the use of derivatives appears to reduce exposures in general.

Moreover, we examine whether firm-specific resources and capabilities differ across firm types and between derivative users and non-users. On the whole, we find that domestic MNCs are larger, but they have lower degree of international involvement than domestic firms and foreign affiliates. On the other hand, we observe that derivative users are larger, lower levered, and have higher level of international involvement than non-users as shown by firm size, leverage and foreign sales to total sales. The univariate tests are robust to analyzing the use of derivatives separately on exchange rate and interest rate derivatives.

6.5.2. Multivariate analysis

6.5.2.1. Exposures and derivatives use on the comparison of domestic firms, domestic MNCs, and foreign affiliates

In terms of exposure to country risks in the panel A, we find some interesting results. For domestic firms, we observe that derivatives use variable is significant and negatively related to exposure to country risks (β = *-0.114, p< 0.1*). It indicates that firms using derivatives reduce exposure by 11.4% for each 1% increase in notional value of general derivatives. It is also clear that in the case of domestic MNCs, exposure to country risks decreases when the general derivatives notional amount increases. Particularly, exposure declines by 13.4% for each 1% increase in notional holdings (β = *-0.134, p< 0.01*), which is higher than domestic firms.

(INSERT TABLE 6.4 HERE)

However, for foreign affiliates, we cannot find any evidence supporting a relationship between derivatives use and exposures to host country risks, though derivative usage has a negative effect on exposure (β = *-0.038, p> 0.1*). In general, the overall results reported in the panel A support the Hypotheses 9 & 8, and our study is one of the first to find that the use of financial derivatives significantly alleviate exposure to home country risks, and domestic MNCs outperform domestic firms and foreign affiliates in terms of reducing exposures.

Similar results are found with regard to exchange rate exposure. The findings presented in panel B indicate that the use of foreign currency derivatives is inversely associated to exchange rate exposure in the case of domestic firms and domestic MNCs ($\beta_{domestic\ firms}$ = *-0.104, p <0.01;* $\beta_{Domestic\ MNCs}$ = *-0.182, p <0.1*). We also notice that derivatives use of foreign affiliates has a negative effect on exposure, though it is not significantly different from zero (β = *-0.138, p> 0.1*). They are consistent with the notion from prior studies that derivative usage is effective in

reducing firms' exchange rate exposures (e.g., Clark and Mefteh, 2011; Zhou and Wang, 2013; Chang, Hsin, and Shiah-Hou, 2013).

On the other hand, the estimated coefficients show a decrease in the exposure of 10.4% and 18.2% per 1% increase in notional holding for domestic firms and domestic MNCs, respectively, which supports the Hypothesis 9. The findings are in contrast to those of Pantzalis *et al.* (2001), Aggarwal and Harper (2010), who find that domestic firms have similar level of exchange rate exposure to MNCs. They are, however, consistent with the view of many international business and finance scholars that domestic MNCs can attain higher performance capitalizing on their FSAs (e.g., Buckley and Casson, 1976; Dunning, 1977, Chung *et al.* 2010; Lee and Rugman, 2012), and due to their superior ability to engage in financial hedging, which should be able to offset some risk exposures they face (Lin, Pantzalis, and Park, 2009; Choi and Jiang, 2009).

In respect of interest rate exposure, we find that regression results comply with Hypothesis 7b, insofar as the negative and significant signs on the use of interest rate derivatives show that derivative usage has significant impact on mitigating interest rate exposure, irrespective of whether firms are domestic firms, domestic MNCs, or foreign affiliates ($\beta_{domestic\ firms} = -0.118,\ p < 0.01;\ \beta_{Domestic\ MNCs} = -0.190,\ p < 0.1;\ \beta_{foreign\ affiliates} = -0.0307,\ p < 0.1$). The estimated coefficients indicate that the use of derivatives decreases interest rate exposure by 11.8%, 19%, and 3.07% per 1% increase in notional derivative holdings for domestic firms, domestic MNCs, and foreign affiliates, respectively, which is consistent with the Hypothesis 9.

The control variables are found to be generally statistically significant and at the expected signs. Exposures show a positive relation with firms' international involvement as measured by FORSALES, and a negative association with firm size and leverage- as expected and in line with the previous studies. Meanwhile, a negative link between the development of country and

financial system and exposures is also found in the table 6.4. However, operational hedging is found to be insignificant in all specifications, which is similar to findings of Kim, Mathur, and Nam (2006), Chang *et al*. (2013).

6.5.2.2. Exposures and the use of derivatives across firm types in the pre-, during-, and post- crisis periods

We repeat pooled regression models when analysis is conducted separately on three sub-periods: 2003-2006, 2007-2008, and 2009-2013 in order to examine how effects of derivatives use on exposures differ across domestic firms, domestic MNCs, and foreign affiliates due to exogenous shocks caused by the global financial crisis of 2007-2008. The results are presented in the table 6.5.

(INSERT TABLE 6.5 HERE)

In terms of exposure to country risks reported in panel A, before the onset of the global financial crisis, we observe a significant negative relation between derivatives use and exposure to home country risks in the case of domestic firms, and domestic MNCs ($\beta_{domestic\ firms}$ = *-0.0749, p <0.1;* $\beta_{Domestic\ MNCs}$ = *-0.0936, p <0.01*), while estimated coefficient of derivative usage is found to be insignificant at any standard level for foreign affiliates, though it is inversely associated with exposure to host country risks ($\beta_{foreign\ affiliates}$ = *-0.0663, p>0.1*). It indicates a reduction in exposure of 7.49% and 9.39% per 1% increase in notional derivative holdings for domestic firms and domestic MNCs, respectively, which supports the Hypotheses 8 and 9.

During the crisis period, in response to the high volatility in market prices and indexes, derivatives users are found to intensify the extent of derivatives use and there is substantial increase in the proportion of derivatives users as shown in the table 6.1. However, we can note that the global financial crisis seems to be associated with a loss of effectiveness in derivatives

hedging. Specifically, we are unable to find evidence that derivatives use significantly reduce domestic firms and foreign affiliates' exposure to country risks ($\beta_{domestic\ firms}$ = *-0.0307, p >0.1;* $\beta_{foreign\ affiliates}$ = *-0.0142, p >0.1*). Meanwhile, in the case of domestic MNCs, the use of derivative shows a significant negative association with exposure to home country risks, but that effect is modest (β = *-0.0297, p<0.05*).

These findings support the Hypothesis 10, and are consistent with finding of Hutson and Laing (2014). One possible explanation is the finding of Allayannis, Brown and Klapper (2003) that most of East Asian non-financial firms conduct selective hedging. Thus, in the times of financial crisis, market price and indexes are largely unpredictable in the short-term and highly increased volatility around the crisis make derivative hedging ineffective for many firms.

In the period after the global financial crisis, conforming to the Hypothesis 10, the use of derivatives is more effective in reducing exposure to country risks, irrespective of domestic firms, domestic MNCs, or foreign affiliates. The statistically significant estimated coefficients of derivative usage show a decrease in exposure of 10.4%, 14.6%, and 10.74% for each 1% increase in notional derivative holdings for domestic firms, domestic MNCs, and foreign affiliates, respectively ($p_{domestic\ firms}$ *<0.1;* $p_{Domestic\ MNCs}$ *<0.01;* $p_{foreign\ affiliates}$ *<0.1*). This finding also supports the hypothesis 9 that domestic MNCs with derivative activities reduce higher degree of exposure than other firms.

With regard to exchange rate exposure presented in panel B, we find that regression results are somewhat similar to those obtained in the panel A. In the pre-crisis period, foreign currency derivative usage of domestic MNCs is negatively associated with exposure (β = *-0.114, p<0.05*), while we are unable to find significant evidence supporting a negative relation between the use of derivatives and exchange rate exposures that domestic firms and foreign affiliates face

($\beta_{domestic\ firms}$ = *-0.121, p >0.1;* $\beta_{foreign\ affiliates}$ = *-0.0164, p >0.1*). During the crisis period, we also notice that the results are consistent with the hypotheses 8 and 10, insofar as domestic MNCs using derivatives are shown to reduce exposure by small percent, that is 1.49% (β = *-0.0149, p<0.1*), while derivatives use of domestic firms, and foreign affiliates has a negative effect on exposure, but it is not significantly different from zero at any standard level ($\beta_{domestic\ firms}$ = *-0.0307, p >0.1;* $\beta_{foreign\ affiliates}$ = *-0.0142, p >0.1*). In the post crisis period, the results confirm a significant negative relation between derivatives use and exposure for all firm types, and the outperformance of domestic MNCs in reducing exposures relative to domestic firms and foreign affiliates ($\beta_{domestic\ firms}$ = *-0.1426, p <0.1;* $\beta_{Domestic\ MNCs}$ = *-0.1781, p <0.01;* $\beta_{foreign\ affiliates}$ = *-0.0100, p <0.1*).

In respect of interest rate exposure reported in the panel C, the results are different from those of panel A and B to some extent, though they conform to the Hypotheses 7b, 8, and 10. Before the crisis, the use of interest rate derivative is always strongly significant and negatively related to exposure regardless of whether firms are domestic, domestic MNCs, or foreign affiliates ($\beta_{domestic\ firms}$ = *-0.1327, p =0.05;* $\beta_{Domestic\ MNCs}$ = *-0.157, p <0.01;* $\beta_{foreign\ affiliates}$ = *-0.0448, p <0.01*). During the crisis, derivative hedging is still effective in reducing exposure to interest rate risks in the case of domestic MNCs, and foreign affiliates ($\beta_{Domestic\ MNCs}$ = *-0.0950, p <0.01;* $\beta_{foreign\ affiliates}$ = *-0.0127, p <0.01*), although it is found to be insignificant at any standard level in the case of domestic firms (β = *-0.0463, p>0.1*). These estimated coefficients show that derivatives use's effect on exposure varies significantly across domestic MNCs, and foreign affiliates, and in times of high interest rate volatility around the crisis, benefits of derivative usage lessen compared to the previous period. After the crisis, consistent with the findings in the table 6.4, we observe a significant negative link between interest rate derivatives usage and

exposures in all cases, and there is greater magnitude of reduction in exposure relative to the crisis period ($\beta_{domestic\ firms}$ = *-0.0998, p <0.05;* $\beta_{Domestic\ MNCs}$ = *-0.1234, p <0.01;* $\beta_{foreign\ affiliates}$ = *-0.0941, p <0.1*).

6.5.3. Robustness tests

6.5.3.1. Instrumental variable (IV) model: controlling for potential endogeneity problem

We notice that in regressions, the use of derivatives and exposures may be endogenously determined due to omitted variables and reserve causality. In view of such potential endogeneity problem, we undertake the instrumental variable (IV) method similar to Gay *et al.* (2011), Chang *et al.* (2013), among others. In this approach, derivative intensity is regarded as an endogenous variable. The first stage of IV regression is an OLS regression model of derivatives use on all explanatory variables in equations 6.4 – 6.6; in the second stage, we apply the two-stage least squares (2SLS) to obtain efficient estimators for heteroskedasticity.

(INSERT TABLE 6.6 HERE)

In the first stage, the choice of instrumental variables, which are potentially related to derivatives use, but are unrelated to exposure, is mainly suggested by previous studies on hedging theories and those on exposures. Specifically, based on the idea of Campello *et al.* (2011) about a tax-based instrumental approach, we use first difference of tax rate, defined as income taxes to pre-tax income, as an instrumental variable. The theoretical research linking derivatives use and tax benefits suggest that progressive marginal tax rates, and tax shields such as tax credits, tax loss carry forwards are closely related to the decision to hedge (e.g., Smith and Stulz, 1985; Stulz, 1996, among others). However, tax convexity is a non-linear function of taxable income, tax codes, and various tax credits (Campello *et al.,* 2011). Therefore, this

measure exhibits characteristics of tax system and structure, eventually lead to an exogenous variation to identify the unbiased influence of derivatives use on exposures.

Furthermore, following Magee (2013), Chang *et al.* (2013), we use R&D expenditures scaled by total sales, first difference of R&D expenditures, and ROA as instrumental variables. Hedging theory and many previous empirical studies suggest that firms with substantial R&D expense are more likely to hedge (Froot *et al.*, 1993; Géczy *et al.,* 1997; Clark and Judge, 2009; Aabo and Ploeen, 2014). A negative relation between ROA and foreign currency hedging is found by some studies such as Allayannis and Ofek (2001), Bartram, Brown, and Fehle (2009), which suggests that the likelihood of financial distress increases for firms that fail to fully hedge. On the other hand, R&D expenditure is a proxy for growth opportunity and found to be positively related to firm value (Allayannis, Lel, and Miller, 2012; Marami and Dubois, 2013), while ROA measures a firm's profitability and positive association with firm value is found (Allayannis and Weston, 2001, Belghitar *et al*, 2013). Thus, they may be unrelated to exposures.

For conciseness, we only report results of the second-stage IV estimation in the table 6.6. To substantiate if the instruments are weak instruments, we estimate Kleibergen-Paap Wald rank F statistic. The F statistics are always greater than Stock and Yogo (2005) critical value (or greater than 10), implying rejection of null hypothesis that the instruments are weak. In addition, the Kleibergen-Paap Wald rank LM statistics are strongly significant ($p < 0.05$, or $p < 0.01$), indicating that the IV model does not have an under-identification problem.

We observe that our main findings presented in the table 6.4 still hold after accounting for potential endogeneity reported in the 2SLS regressions. In panel A for exposure to country risks, we observe a significant negative relation between derivatives use and exposure when firms are domestic firms ($\beta = -0.0761, p<0.05$), or domestic MNCs ($\beta = -0.1654, p<0.01$), while in the

case of foreign affiliates, the estimated coefficient on derivative use variable is found to be insignificant at any standard level (β = *-0.0344, p>0.1*). In panels B and C, we find conforming results with prior section when the analysis is conducted separately on exposure to exchange rate and interest rate risks. The coefficients on foreign currency derivatives in panel B for domestic firms and domestic MNCs are -0.1498 (*p<0.1*) and -0.1558 (*p<0.05*), but it is not different from zero at any conventional significance level for foreign affiliates (β = *-0.167, p>0.1*). In panel C, we note that there is a significant inverse relationship between the use of interest rate derivatives and interest rate exposure regardless of firm types ($\beta_{domestic\ firms}$ = *-0.125, p <0.05;* $\beta_{Domestic\ MNCs}$ = *-0.1667, p <0.05;* $\beta_{foreign\ affiliates}$ = *-0.0910, p <0.01*).

6.5.3.2. Additional test: random effects model

In this section, we conduct panel data regressions with random effect specification in analyzing the impact of derivatives use on exposures from different aspects. The results are presented in table 6.7.

(INSERT TABLE 6.7 HERE)

For domestic firms, the estimated coefficients on general derivative, foreign currency, and interest rate derivative intensities are significantly negative at -0.1104, -0.1010, and -0.1630 (*p < 0.1, p < 0.01,* and *p <0.05*), respectively, indicating that in all cases the use of derivatives contributes to an reduction in exposures to home country risks, exchange rate, and interest rate risks. For foreign affiliates, we obtain the findings very similar to those found in table 7.4, in which only coefficient on the use of interest rate derivatives is significantly inverse to interest rate exposure (β = *-0.0307, p<0.1*), while we fail to find any significant evidence supporting a

negative link between derivatives use and exposures to host country risks and exchange rate exposures ($\beta_{in\ panel\ A} = 0.2559, p > 0.1; \beta_{in\ panel\ B} = -0.138, p > 0.1$).

For domestic MNCs, similar findings to those found in table 6.4 are observed as we again evidence that general derivatives use, the use of foreign currency, and interest rate derivatives separately are associated with lower degrees of equivalent types of exposures ($\beta_{in\ panel\ A} = -0.1430, p < 0.01; \beta_{in\ panel\ B} = -0.1311, p < 0.1; \beta_{in\ panel\ C} = -0.1750, p < 0.05$). We also notice that the estimated coefficients on derivatives use for domestic MNCs are larger in magnitude than domestic firms and foreign affiliates, conforming to findings in the previous section that the negative relation between derivatives use and exposures is strongest for domestic MNCs.

In short, the overall results of robustness tests altogether indicate that our main inferences are mostly robust after controlling for endogeneity issue, and using various regression specifications.

6.6. Conclusion

In this study, we investigated the impacts of derivatives use on multifaceted exposures including exposures to home/host country risks, exchange rate exposure, and interest rate exposure by utilizing a large unique hand-collected data set containing information of derivatives activities of non-financial firms in eight East Asian countries over the period of 2003-2013. To our knowledge so far, this study is one of the first to explore that dynamic relationship on the comparison of different firm types: domestic firms, domestic MNCs, and foreign affiliates.

The primary theoretical contribution of this study is to apply the market model into estimating exposures to home and host country risks. As such, we demonstrate how country risk exposures can be measured using well-know linear regression techniques, and in the way conforming to the interests of policy-makers, stockholders, investors, and analysts. The concept

that exposure to country risks can be measured as a regression coefficient should hold good attraction for that group, as firms are not free from country risks, efforts must be made by each firm to approximate and quantify their exposure.

The first and major empirical contribution of this research is to provide strong evidence that the use of financial derivatives by domestic firms and domestic MNCs significantly contribute to a decline in exposure to home country risks at the rate of 11.4% to 13.4% per 1% increase in notional derivative holdings, respectively. Yet, financial hedging of foreign affiliates cannot reduce exposure to host country risks. These findings are robust after accounting for endogeneity and many specifications.

We then complement and shed new light on the current literature on hedging when we evidence the outperformance of domestic MNCs in reducing exposures to exchange rate and interest rate risks vis-à-vis domestic firms and foreign affiliates. We first reports that derivative users have, on average, a lower degree of exposures than non-users; and domestic MNCs have smaller exposures to country risks, exchange rate, and interest rate risks relative to domestic firms and foreign affiliates. In all models we find observed reductions in exposures is more striking for domestic MNCs, while domestic firms using derivatives experience smaller decline in their exposures, and the use of derivatives by foreign affiliates is only able to reduce interest rate exposure.

Additionally, we provide new insights into firms' hedging activities when there is exogenous shock by taking into consideration the global financial crisis. We observe that the financial crisis with unexpected high volatility in market prices and indexes lessens benefits from derivatives use. Domestic firms and foreign affiliates are unable to reduce exposures to country risks, and exchange rate risks, while domestic MNCs experience moderate reduction in

exposures. However, we find the strongest negative association between derivatives use and exposures for all firms in the post-crisis.

Our study also has direct practical and meaningful implications for firms' managers on decision regarding capital structure. In particular, the research provides new evidence that in East Asian countries, besides the effectiveness of domestic firms and domestic MNCs' derivatives use in reducing exposures to home country risks, and exchange rate risks, regardless of firm type, a firm's exposure to interest rate movements is mitigated to varied degrees, ranging from 3.07% to 19% for each 1% increase in notional derivative holdings. These findings suggest that firms could influence cost of capital in particular, and capital structure in general by the use of financial derivatives, thus firm managers better perform the important tasks of strategic capital planning and managing risks.

Table 6.1: Descriptive statistics of derivatives use of sample firms

This table shows the number of firms and the percentage of firms that use derivatives. We present derivatives users separately for any derivatives, foreign currency derivatives (FCD), and interest rate derivatives (IRD). Panel A presents derivatives use based on firm-year observations by country. Panel B reports the information about the use of derivatives by derivative users, non-users and notional value of derivatives contracts. Panel C shows the trend of derivatives use over time.

Panel A: Derivatives use by country

Countries	**Total**	**Any derivatives**		**Foreign currency derivatives**		**Interest rate derivatives**	
	N	*N*	*%*	*N*	*%*	*N*	*%*
Indonesia	429	158	36.83	122	28.44	111	25.87
Philippines	352	352	100.00	139	39.49	99	28.12
Singapore	1639	651	39.72	735	44.98	434	26.58
Japan	1661	1661	100.00	1293	78.22	1020	61.71
Hong Kong	1606	382	23.79	350	21.88	265	16.56
Malaysia	1760	669	38.01	661	37.58	219	12.46
China	1111	179	16.11	202	18.20	100	9.01
Thailand	1133	1133	100.00	613	54.10	247	21.84
Total	9691	5185	53.50	4115	42.55	2495	25.81

Panel B: Firms' derivatives use information

	Observations	**Mean**	**Standard Deviation**
Notional value of FCD	8842	245118.4	2121091
Notional value of IRD	9095	328000.5	4793611
Notional value of any derivative	6070	339721.1	4300822

Panel C: Derivatives use by year

Years	**Total**	**Any derivatives**		**Foreign currency derivatives**		**Interest rate derivatives**	
	N	*N*	*%*	*N*	*%*	*N*	*%*
2003-2006	3524	1752	49.72	1293	36.71	782	22.20
2007-2008	881	477	54.14	387	43.98	225	25.57
2009-2013	4405	2462	55.89	2021	46.06	1261	28.77
Total	9691	5185	53.50	4115	42.55	2495	25.81

Table 6.2: Definitions of variables

This table defines the dependent and independent variables, and control variables that we examine

Variables	Definitions	Sources
Dependent variables		
$\lvert\widehat{\boldsymbol{\beta}}_{2ijt}\rvert$	Absolute value of exposure to country risks estimated from equation (7.1) of firm *i* located in country *j* in year *t*	Authors' estimation
$\lvert\widehat{\boldsymbol{\beta}}_{3ijt}\rvert$	Absolute value of exposure exchange rate risks estimated from equation (7.2) of firm *i* located in country *j* in year *t*	Authors' estimation
$\lvert\widehat{\boldsymbol{\beta}}_{4ijt}\rvert$	Absolute value of exposure to interest rate risks estimated from equation (7.3) of firm *i* located in country *j* in year *t*	Authors' estimation
Main independent variables		
DER	General derivative intensity (notional value of derivatives contracts in thousand USD / total assets)	Authors' calculation
FCD	Foreign currency (FC) derivative intensity (notional value of FC derivatives contracts in thousand USD / total assets)	Authors' calculation
IRD	Interest rate (IR) derivative intensity (notional value of IR derivatives contracts in thousand USD / total assets)	Authors' calculation
Control variables		
Firm size	Natural logarithm of market value of total assets scaled by Producer price index (PPI)	Datastream
Leverage	Total debt to total assets	Datastream
FORSALES	Foreign sales to total sales	Datastream
GEOMARKT	Dummy variable which has a value of one for firms that have sale markets in foreign countries, and zero otherwise	Authors' construction
Industrial diversification	Dummy variable which equals one for firms operating in more than one business segment in the SIC industry classification, and zero otherwise	Authors' construction
GDP per capita	Gross domestic products (GDP) / midyear population	World Bank
Financial system deposits to GDP	The demand, time, saving deposits in deposit money banks and other financial institutions as a share of GDP	World Bank
Rule of law	Index measuring the confidence of agents in and abide by the rules of society, the quality of contract enforcement, property rights with -2.5 (weak) to 2.5 (strong)	World Bank

Table 6.3: Summary statistics: Derivatives users versus non-users

This table presents a summary statistics of characteristics between firms using derivatives and those firms do not. Panel A reports summary statistics for the variables for the domestic firms that use either foreign currency derivatives, interest rate derivatives or commodity price derivatives (derivative users) and firms that do not (derivatives non-users). Panel B displays the mean, standard deviation for variables of domestic MNCs only separately for derivatives users and non-users. Panel C presents these values for foreign affiliates only. *P*-values for testing the difference in mean are also reported. Asterisks ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

Variables	General derivatives use					
	All firms		Users	Non-users	Difference in means	*P*- value
	Obs	Mean	Mean	Mean	Non-users – Users	
Panel A: Domestic firm						
β country risks	3959	0.1761	0.1484	0.2004	0.0521	0.161
β FX risks	3959	0.2772	0.2012	0.3442	0.1429	0.022**
β IR risks	3959	0.7445	0.5604	0.9068	0.3463	0.007***
Firm size	4218	5.4300	5.7169	5.1739	-0.5430	0.000***
Leverage	4237	25.016	23.823	26.072	2.2484	0.309
FORSALES	2952	41.836	42.566	41.147	-1.4191	0.323
GEOMART	3787	0.5147	0.5014	0.5263	0.0249	0.124
Diversification indicator	4158	0.3942	0.4035	0.3857	-0.0177	0.241
Panel B: Domestic MNCs						
β country risks	4390	0.1405	0.1324	0.1495	0.0169	0.311**
β FX risks	4390	0.1867	0.1681	0.2074	0.0393	0.431*
β IR risks	4390	0.5358	0.4310	0.6528	0.2217	0.017**
Firm size	4603	6.3791	7.0131	5.6861	-1.326	0.000***
Leverage	4620	23.754	22.890	24.697	1.8069	0.137
FORSALES	3219	31.995	32.842	30.830	-2.0124	0.091*
GEOMART	4368	0.7704	0.7850	0.7549	-0.0300	0.018**
Diversification indicator	4565	0.5301	0.5454	0.5131	-0.0322	0.068*
Panel C: Foreign affiliates						
β country risks	679	0.1523	0.1337	0.1462	0.0325	0.043
β FX risks	679	0.2499	0.2513	0.2488	-0.0024	0.967
β IR risks	679	0.9340	0.8793	0.9749	0.0956	0.766**
Firm size	704	5.4215	5.6719	5.2502	-0.4216	0.015**
Leverage	702	29.937	24.466	33.699	9.2331	0.431
FORSALES	507	34.418	36.440	32.752	-3.688	0.245
GEOMART	675	0.6592	0.6212	0.6836	0.0624	0.098*
Diversification indicator	704	0.4218	0.3298	0.4866	0.1567	0.000***

Table 6.4: Exposures and derivatives use

This table reports the effects of derivatives use on exposures across domestic firms, domestic MNCs, and foreign affiliates from pooled regression models split up with regard to exposure to country risks, exchange rate, and interest rate risks. The dependent variable are absolute values of exposures to country risks $|\widehat{\beta}_{2ijt}|$ (panel A), exchange rate risks $|\widehat{\beta}_{3ijt}|$ (panel B), and interest rate risks $|\widehat{\beta}_{4ijt}|$ (panel C). DER is the notional value of any derivative contracts in thousand USD scaled by total assets. FCD is the notional value of foreign currency derivatives in thousand USD scaled by total assets. IRD is the notional value of interest rate derivatives in thousand USD scaled by total assets. All other independent variables definitions are reported in Table 6.2. Standard errors are clustered by country to control for heteroscedasticity and serial correlation. *P*-values are in parentheses. Asterisks ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

Variables	**Domestic firms**		**Domestic MNCs**		**Foreign affiliates**	
Panel A: Exposure to country risks						
DER	-0.114*	(0.058)	-0.134***	(0.007)	-0.038	(0.343)
Firm size	-1.239	(0.482)	-0.776**	(0.018)	-0.494	(0.251)
Leverage	-0.034	(0.477)	-0.0386	(0.686)	0.069	(0.373)
FORSALES	0.068	(0.215)	0.0563*	(0.073)	0.096**	(0.029)
GEOMART	-0.368	(0.570)	-0.295	(0.204)	0.142	(0.963)
Diversification indicator	-0.288	(0.359)	-0.347	(0.126)	-0.820	(0.780)
GDP per capita	0.568	(0.946)	0.121	(0.136)	0.629**	(0.011)
DEPOSITSTOGDP	-0.819***	(0.006)	-0.116	(0.130)	-0.073*	(0.083)
Rule of law	4.911	(0.853)	10.58	(0.528)	-0.388*	(0.051)
Intercept	20.21	(0.860)	-148.8	(0.196)	-958.7**	(0.012)
Country dummies	Yes		Yes		Yes	
Industry dummies	Yes		Yes		Yes	
Year dummies	Yes		Yes		Yes	
No of observations	2007		1136		198	
R-square	0.323		0.256		0.404	
Panel B: FX exposures						
FCD	-0.104***	(0.000)	-0.182*	(0.051)	-0.138	(0.917)
Firm size	-0.1456*	(0.056)	-0.188	(0.111)	-0.163	(0.347)
Leverage	-0.0101	(0.500)	-0.0416*	(0.086)	0.051	(0.312)
FORSALES	0.0107	(0.778)	0.0326	(0.377)	0.034	(0.875)
GEOMART	0.238	(0.919)	-0.0313	(0.347)	0.1491	(0.547)
Diversification indicator	0.165	(0.404)	-0.0414	(0.146)	0.1297	(0.933)
GDP per capita	0.126***	(0.006)	0.202*	(0.070)	0.3659	(0.156)
DEPOSITSTOGDP	-0.410***	(0.010)	-0.0462***	(0.009)	-0.197***	(0.002)
Rule of law	-0.306*	(0.079)	0.160	(0.482)	-0.4365	(0.691)
Intercept	-214.9***	(0.002)	-2.645*	(0.072)	-3335.6	(0.167)
Country dummies	Yes		Yes		Yes	
Industry dummies	Yes		Yes		Yes	
Year dummies	Yes		Yes		Yes	
No of observations	1053		1250		410	
R-square	0.225		0.290		0.308	
Panel C: IR exposures						
IRD	-0.118***	(0.005)	-0.190*	(0.051)	-0.0307*	(0.087)
Firm size	-0.0196	(0.364)	-0.0832*	(0.061)	-0.0596	(0.107)
Leverage	-0.0254**	(0.038)	-0.0143	(0.308)	-0.0327**	(0.045)
FORSALES	0.0736**	(0.041)	0.0682	(0.727)	0.0780	(0.846)
GEOMART	0.0205	(0.934)	-0.253	(0.346)	0.265	(0.419)
Diversification indicator	0.134	(0.630)	-0.100	(0.373)	-0.321	(0.290)
GDP per capita	-0.119	(0.905)	-1.639	(0.234)	-1.729	(0.509)
DEPOSITSTOGDP	-0.0445*	(0.059)	-0.0226**	(0.013)	-0.0465***	(0.000)
Rule of law	-0.5790	(0.173)	-0.1654	(0.148)	-0.3139	(0.197)
Intercept	-5.395	(0.618)	-15.50	(0.220)	21.97	(0.583)
Country dummies	Yes		Yes		Yes	
Industry dummies	Yes		Yes		Yes	
Year dummies	Yes		Yes		Yes	
No of observations	591		2398		430	
R-square	0.326		0.278		0.362	

Table 6.5: Exposures and derivatives usage before, after, and during the global financial crisis

This table reports the effects of derivatives use on exposures across domestic firms, domestic MNCs, and foreign affiliates before, after and during the global financial crisis of 2007-2008 from pooled regression models split up with regard to exposure to country risks, exchange rate, and interest rate risks. The dependent variable are absolute values of exposures to country risks $|\widehat{\beta}_{2ijt}|$ (panel A), exchange rate risks $|\widehat{\beta}_{3ijt}|$ (panel B), and interest rate risks $|\widehat{\beta}_{4ijt}|$ (panel C). DER is the notional value of any derivative contracts in thousand USD scaled by total assets. FCD is the notional value of foreign currency derivatives in thousand USD scaled by total assets. IRD is the notional value of interest rate derivatives in thousand USD scaled by total assets. All other independent variables definitions are reported in Table 6.2. Standard errors are clustered by country to control for heteroscedasticity and serial correlation. *P*-values are in parentheses. Asterisks ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

Variables	Domestic firms			Domestic MNCs			Foreign affiliates		
	2003-2006	2007-2008	2009-13	2003-2006	2007-2008	2009-2013	2003-2006	2007-2008	2009-2013
Panel A: Exposure to country risks									
DER	-0.0749*	-0.0307	-0.104*	-0.0936***	-0.0297**	-0.146***	-0.0663	-0.0142	-0.1074*
	(0.096)	(0.264)	(0.064)	(0.003)	(0.023)	(0.009)	(0.179)	(0.161)	(0.055)
Leverage	-0.148	-0.0344	0.0236***	-0.0161**	0.0290	-0.0396	-0.0526***	0.0585***	-0.00117
	(0.288)	(0.775)	(0.003)	(0.026)	(0.306)	(0.814)	(0.006)	(0.005)	(0.947)
FORSALES	0.135	0.431*	0.0653	0.0188**	0.0306**	0.0869	-0.0522	-0.0960	-0.0920
	(0.447)	(0.100)	(0.186)	(0.015)	(0.035)	(0.246)	(0.986)	(0.182)	(0.353)
DEPOSITSTOGDP	-0.4906**	-0.0118*	-0.0175	-0.109	-1.202	0.0793***	0.0656	-0.0925***	-0.0796
	(0.014)	(0.093)	(0.131)	(0.228)	(0.124)	(0.002)	(0.201)	(0.004)	(0.295)
Intercept	-1211.2	241.9	-34.63*	-46.33	50.48	-2.664**	-6.775	-0.109	10.54
	(0.553)	(0.163)	(0.054)	(0.565)	(0.117)	(0.018)	(0.443)	(0.938)	(0.975)
Other control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No of observations	566	104	511	633	228	1214	110	41	191
R-square	0.243	0.252	0.147	0.364	0.396	0.435	0.610	0.763	0.354
Panel B: FX exposures									
FCD	-0.121	-0.0136	-0.1426*	-0.114**	-0.0149*	-0.1781***	-0.0164	-0.0454	-0.0100*
	(0.483)	(0.761)	(0.058)	(0.018)	(0.081)	(0.000)	(0.484)	(0.128)	(0.068)
Leverage	-0.0314	-0.0343*	-0.0221	0.0206	0.0409	-0.0125	-0.0438	-0.0106	-0.0625***
	(0.104)	(0.0723)	(0.826)	(0.558)	(0.529)	(0.315)	(0.127)	(0.627)	(0.000)
FORSALES	0.7375*	0.159	0.5024	0.0527	0.0111	0.107	0.0416*	0.2317***	0.3492*
	(0.096)	(0.520)	(0.130)	(0.886)	(0.990)	(0.426)	(0.092)	(0.006)	(0.054)
DEPOSITSTOGDP	-0.1600**	-0.225*	-0.898*	-0.0971*	-0.0182*	-0.0638*	-0.0364	-0.0294	-0.1270*
	(0.022)	(0.069)	(0.079)	(0.098)	(0.061)	(0.087)	(0.563)	(0.322)	(0.068)
Intercept	-567.4*	6.836	-806.0	-15.23***	1.473**	-7.590	-6.106**	3.370*	3426.4***
	(0.064)	(0.770)	(0.540)	(0.004)	(0.016)	(0.340)	(0.045)	(0.073)	(0.004)
Other control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No of observations	331	107	1413	863	107	1601	110	41	220
R-square	0.223	0.241	0.332	0.475	0.859	0.435	0.737	0.384	0.549
Panel C: IR exposures									
IRD	0.1327**	-0.0463	-0.0998**	-0.157***	-0.0950***	-0.1234***	-0.0448***	-0.0127***	0.0941*
	(0.050)	(0.987)	(0.042)	(0.000)	(0.003)	(0.001)	(0.000)	(0.000)	(0.055)
Leverage	-0.0534	0.139	0.0104	-0.0604	0.0448	-0.0386*	0.0421	-0.0731	0.0626
	(0.381)	(0.340)	(0.838)	(0.594)	(0.572)	(0.069)	(0.102)	(0.989)	(0.404)
FORSALES	0.0316	0.332*	0.0847**	0.0499	0.0583**	0.0143	0.0273***	0.0943	-0.0181
	(0.796)	(0.085)	(0.013)	(0.547)	(0.013)	(0.617)	(0.004)	(0.318)	(0.301)
DEPOSITSTOGDP	-0.0374	-0.592***	-0.0110***	-0.0811*	0.0503	-0.0181**	-0.0785	-0.0943**	0.0820
	(0.500)	(0.000)	(0.000)	(0.095)	(0.143)	(0.011)	(0.173)	(0.015)	(0.373)
Intercept	-5.610	185.2	4.240	-0.217	1.818***	0.968	-27.24	-0.256	95.21
	(0.432)	(0.110)	(0.309)	(0.449)	(0.002)	(0.661)	(0.915)	(0.865)	(0.487)
Other control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No of observations	195	199	329	752	75	1215	46	40	193
R-square	0.254	0.473	0.366	0.329	0.428	0.472	0.969	0.795	0.543

Table 6.6: Instrumental variable (IV) model

This table presents the impacts of derivatives use on exposures across domestic firms, domestic MNCs, and foreign affiliates from instrumental variable models (IV) split up with regard to exposure to country risks, exchange rate, and interest rate risks. The dependent variable are absolute values of exposures to country risks $|\widehat{\beta}_{2ijt}|$ (panel A), exchange rate risks $|\widehat{\beta}_{3ijt}|$ (panel B), and interest rate risks $|\widehat{\beta}_{4ijt}|$ (panel C). DER is the notional value of any derivative contracts in thousand USD scaled by total assets. FCD is the notional value of foreign currency derivatives in thousand USD scaled by total assets. IRD is the notional value of interest rate derivatives in thousand USD scaled by total assets. All other independent variables definitions are reported in Table 6.2. Standard errors are clustered by country to control for heteroscedasticity and serial correlation. *P*-values are in parentheses. Asterisks ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

Variables	**Domestic firms**		**Domestic MNCs**		**Foreign affiliates**	
Panel A: Exposure to country risks						
DER	-0.0761**	(0.038)	-0.1654***	(0.003)	-0.0344	(0.508)
Firm size	0.0444	(0.224)	-0.855***	(0.002)	-0.0134***	(0.001)
Leverage	0.0341	(0.432)	-0.0126	(0.221)	-0.0119	(0.362)
FORSALES	0.0162**	(0.029)	0.0362***	(0.000)	-0.0285	(0.586)
DEPOSITSTOGDP	-0.0347	(0.279)	-0.0333**	(0.019)	0.0112	(0.938)
Rule of law	0.0190	(0.321)	-0.2870**	(0.027)	0.0180	(0.924)
Intercept	4.453***	(0.000)	-5.468**	(0.035)	-9.510***	(0.001)
Other control variables	Yes		Yes		Yes	
Country dummies	Yes		Yes		Yes	
Industry dummies	Yes		Yes		Yes	
Year dummies	Yes		Yes		Yes	
Kleibergen-Paap Wald rk F statistic	132.00		49.16		125.13	
Kleibergen-Paap rk LM statistic (p-value)	0.0064		0.0291		0.0042	
No of observations	1437		965		241	
R-square	0.210		-0.249		0.172	
Panel B: FX exposures						
FCD	-0.1498*	(0.063)	-0.1558**	(0.022)	-0.167	(0.915)
Firm size	-0.4228	(0.215)	-0.0736***	(0.000)	-0.065	(0.970)
Leverage	-0.0315	(0.682)	0.0505	(0.952)	-0.092*	(0.058)
FORSALES	-0.241	(0.177)	-0.0323	(0.763)	-0.0514	(0.111)
DEPOSITSTOGDP	-0.100	(0.102)	0.0605	(0.358)	0.0114	(0.366)
Rule of law	0.1592	(0.111)	-0.161**	(0.036)	-0.146	(0.328)
Intercept	-108.4	(0.369)	-11.398**	(0.024)	-5.136***	(0.002)
Other control variables	Yes		Yes		Yes	
Country dummies	Yes		Yes		Yes	
Industry dummies	Yes		Yes		Yes	
Year dummies	Yes		Yes		Yes	
Kleibergen-Paap Wald rk F statistic	121.54		141.79		127.13	
Kleibergen-Paap rk LM statistic (p-value)	0.0039		0.0071		0.0423	
No of observations	1025		1173		243	
R-square	-0.167		-23.611		-0.112	
Panel C: IR exposures						
IRD	-0.125**	(0.033)	-0.1667**	(0.043)	-0.0910***	(0.000)
Firm size	-0.0707	(0.256)	-1.225**	(0.025)	-0.0462	(0.110)
Leverage	-0.0258	(0.154)	-0.0356**	(0.029)	-0.0119*	(0.061)
FORSALES	0.0184	(0.495)	-0.0107	(0.263)	-0.0170	(0.473)
DEPOSITSTOGDP	-0.0404**	(0.020)	-0.0471**	(0.041)	-0.0315	(0.249)
Rule of law	-0.279***	(0.009)	-1.750	(0.245)	0.280	(0.366)
Intercept	-1.185	(0.193)	-12.43	(0.162)	3.418***	(0.000)
Other control variables	Yes		Yes		Yes	
Country dummies	Yes		Yes		Yes	
Industry dummies	Yes		Yes		Yes	
Year dummies	Yes		Yes		Yes	
Kleibergen-Paap Wald rk F statistic	142.23		55.71		122.09	
Kleibergen-Paap rk LM statistic (p-value)	0.0061		0.0308		0.0002	
No of observations	426		1853		238	
R-square	0.218		-0.306		0.337	

Table 6.7: Random effects model

This table presents the impacts of derivatives use on on exposures across domestic firms, domestic MNCs, and foreign affiliates from random effects models split up with regard to exposure to country risks, exchange rate, and interest rate risks. The dependent variable are absolute values of exposures to country risks $|\widehat{\beta}_{2ijt}|$ (panel A), exchange rate risks $|\widehat{\beta}_{3ijt}|$ (panel B), and interest rate risks $|\widehat{\beta}_{4ijt}|$ (panel C). DER is the notional value of any derivative contracts in thousand USD scaled by total assets. FCD is the notional value of foreign currency derivatives in thousand USD scaled by total assets. IRD is the notional value of interest rate derivatives in thousand USD scaled by total assets. All other independent variables definitions are reported in Table 6.2. Standard errors are clustered by country to control for heteroscedasticity and serial correlation. *P*-values are in parentheses. Asterisks ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

Variables	**Domestic firms**		**Domestic MNCs**		**Foreign affiliates**	
Panel A: Country risks						
DER	-0.1104*	(0.087)	-0.1430***	(0.005)	0.0259	(0.585)
Firm size	-0.1391	(0.470)	-0.302*	(0.073)	-0.645	(0.102)
Leverage	-0.0346	(0.401)	0.0449	(0.563)	-0.0343**	(0.024)
FORSALES	0.068*	(0.065)	0.0108	(0.536)	0.0707**	(0.049)
GEOMART	0.3688	(0.468)	0.2841	(0.111)	-0.2539	(0.334)
Diversification indicator	-0.2883	(0.361)	0.2369*	(0.088)	-0.0984	(0.965)
GDP per capita	0.568**	(0.046)	-0.1033	(0.457)	-0.0302	(0.976)
DEPOSITSTOGDP	-0.819	(0.340)	-0.120**	(0.038)	-0.0689**	(0.039)
Rule of law	0.4911	(0.912)	0.1339	(0.536)	-0.6676**	(0.021)
Intercept	20.21	(0.859)	189.8	(0.349)	3.372	(0.786)
Country dummies	Yes		Yes		Yes	
Industry dummies	Yes		Yes		Yes	
Year dummies	Yes		Yes		Yes	
No of observations	2007		2506		438	
Panel B: FX exposures						
FCD	-0.1010***	(0.007)	-0.1311*	(0.088)	-0.138	(0.957)
Firm size	-0.2095***	(0.003)	-0.0178*	(0.066)	-0.1636*	(0.057)
Leverage	-0.0778	(0.604)	-0.0395*	(0.056)	0.0515	(0.868)
FORSALES	0.0258	(0.335)	0.0391	(0.476)	0.0340	(0.949)
GEOMART	-0.767	(0.631)	-0.0323	(0.435)	0.1491	(0.516)
Diversification indicator	0.1579	(0.469)	-0.0395	(0.177)	-0.1297	(0.973)
GDP per capita	-0.3777	(0.105)	0.185**	(0.049)	0.651**	(0.025)
DEPOSITSTOGDP	-0.103***	(0.006)	-0.0472**	(0.020)	-0.1971	(0.409)
Rule of law	-0.4592	(0.291)	0.159	(0.430)	-0.4365	(0.878)
Intercept	51.52	(0.135)	-2.404*	(0.067)	149.4	(0.396)
Country dummies	Yes		Yes		Yes	
Industry dummies	Yes		Yes		Yes	
Year dummies	Yes		Yes		Yes	
No of observations	1053		1250		410	
Panel C: IR exposures						
IRD	-0.1630**	(0.018)	-0.1750**	(0.046)	-0.0307*	(0.092)
Firm size	-0.565	(0.878)	-0.0737**	(0.041)	-0.0659	(0.470)
Leverage	-0.0960	(0.911)	-0.0235**	(0.012)	-0.0217*	(0.100)
FORSALES	0.397**	(0.037)	0.0110	(0.594)	0.0747	(0.924)
GEOMART	-0.186	(0.989)	-0.107	(0.433)	0.2165	(0.454)
Diversification indicator	0.1757	(0.860)	-0.107	(0.253)	-0.3521	(0.493)
GDP per capita	-0.1909***	(0.000)	-0.876	(0.516)	-0.2480**	(0.041)
DEPOSITSTOGDP	-0.4486***	(0.000)	-0.0432***	(0.000)	-0.0563**	(0.044)
Rule of law	-0.2236***	(0.002)	0.420	(0.320)	-0.3139	(0.115)
Intercept	1522.9***	(0.000)	8.560	(0.487)	6.953	(0.836)
Country dummies	Yes		Yes		Yes	
Industry dummies	Yes		Yes		Yes	
Year dummies	Yes		Yes		Yes	
No of observations	2061		2398		430	

CHAPTER 7

SUMMARY AND CONCLUSIONS

7.1. Introduction

In this thesis, we aim to explore the link between macro environment and firm specifics in deriving firms' hedging behavior. To do so, we have conducted comprehensive empirical analyses of determinants of financial derivatives use by non-financial firms, as well as the relationship between derivatives use, firm value, and exposures. The study has employed a wide range of empirical techniques to investigate whether cross-firm differences in hedging behaviors can be explained by differences in country-level governance quality. We then have examined whether derivatives use increases firm value of non-financial firms, and how value effect under influence of corruption environment differs across domestic firms, domestic MNCs, and foreign affiliates. We further have provided empirical evidence to answer the following questions in East Asia context. (1) Does financial hedging through derivatives use reduce exposures to country risks, exchange rate, and interest rate risks that firms face? (2) How are derivatives activities of domestic MNCs, domestic firms, and foreign affiliates different from each other in terms of effects on exposures?

To fulfill the research questions and objectives, we have undertaken the unique hand-collected data set of derivatives activities from 881 non-financial firms in eight East Asian countries over the period of 2003-2013. The data of derivatives use are collected from the relevant disclosures in annual reports by using keyword search approach. The main measure of derivatives behavior is derivative intensity, which is notional amount of derivatives use scaled by

firm size at a fiscal year end. Besides, in chapter 4, we also constructed derivative dummy, which takes a value of one if a firm is identified as a derivative user, and zero otherwise. In chapter 5, we calculated Tobin's Q to measure firm value, and estimate different types of exposures in chapter 6. Accounting and financial data for explanatory and control variables were obtained from Datastream or constructed on the basis of data from Corporate Affiliations database. Meanwhile, we collected country-specific data from different sources, e.g., corruption is from Transparency International, country's overall risk rating is from the Economist Intelligence Unit, financial system deposits to GDP is from the World Bank's World Development Indicators. The consistency and reliability of these data have been checked and described carefully in each empirical chapter.

Regarding literature review, the thesis reviews the hedging theory and institutional theory approach, discusses how that theory has been assessed in the empirical literature and whether the theories underpin what is observed in practice. We critically examines the existing literature over a few last decades from 1993 to present, which has focused on testing hedging theory, and the extent to which it supports or refutes hedging theory by reviewing proxy variables used to test these hypotheses. We find that the extant literature lacks consistency in measurement of variables determining derivatives use. Thus, it leads to complexity in interpreting results and makes analyses less powerful. Moreover, we indicate that several recent studies, which consider new explanations for firms' incentives to use derivatives, also provide overall mixed results at best. As such, it is necessary to improve hedging theory (e.g., Modigiliani and Miller, 1958; Mayer and Smith, 1982; Smith and Stulz, 1985), as well as the variables to measure determinants of derivatives use.

Furthermore, we have reviewed empirical studies on relationship between derivatives use and firm value outside East Asia and in East Asia from 2001 to the present, separately. We divided existing empirical studies into 2 categories, unconditional analyses and conditional analyses. We find that in spite of different measures across studies, Tobin's Q is the most popular proxy of firm value in both unconditional and conditional studies, and they provide mixed evidence at best. The impact of derivatives use on firm value is, therefore, an open empirical issue.

Finally, after reviewing thoroughly the association between derivatives use and exposures, we find that the mixed results of prior studies may be attributed to different choices of models. More importantly, we find a great differences in the effects of derivatives use on exposures, ranging from 2.387% to 54%. Such variation may derive from the fact that firms use other hedging methods besides derivatives, or firms selectively hedge; or the amount of derivatives is small, or exposures are time-varying.

The remainder of this chapter is organized as follows. Section 2 summarizes the main inferences from our three empirical studies. Section 3 presents limitations of the thesis, and proposes some suggestions for the future research. The contributions then are drawn based on the findings in the section 4.

7.2. Overall discussion and conclusions from empirical analyses

7.2.1. Determinants of derivatives use

Most of existing studies consider only firm-specific factors as determinants of hedging behavior. Yet, firm specific characteristics alone cannot fully explain firms' behaviors. Filling this gap in the literature, we have focused on the role of country-specific factors in shaping firms' decisions to use derivatives. Specially, we have explored the link between the use of

financial derivatives in East Asian non-financial firms and governance quality. Our descriptive statistics show that 53.5% of the sample firms use at least one type of derivatives during the sample period, in which the most common instruments are foreign currency derivatives (42.55%), followed by interest rate derivatives (25.81%), and commodity price derivatives (8.99%). The univariate results suggest that the quality of governance mechanism as measured by corruption, government effectiveness and country risk could be very important factors.

The main findings from the pooled probit analysis support the hypothesis that good governance increases firm's inclination to use derivatives. We find a positive and significant association between corruption and firms' likelihood of using derivatives, while there exists a significant and positive effect of government effectiveness on the firm's tendency to use derivatives. The estimated coefficient on overall risk rating, in addition, is positively and statistically different from zero.

When we repeat pooled probit models based on corruption levels, we find that the decision on using derivatives by firms in highly corrupt countries is quite different from those firms in low corrupt countries. Firms located in highly corrupt countries do not use derivatives to reduce agency cost of debt; while the more the progressive marginal tax rates are, the less the firms are induced to use derivatives. More importantly, the findings show that those firms do not use derivatives to eliminate exposures to financial risks, but for other purposes such as speculating or self-managerial interests.

The results from pooled Tobit estimations are consistent with findings from Probit models. In particular, corruption index has a significant and positive impact on intensity of derivatives use. We also observe a positive effect for government effectiveness. These results altogether suggest that good institutions with strong legal enforceability and governance capabilities lower

hedging costs; hence facilitating firms to use derivatives. Likewise, we find that the effects of some factors vary across types of derivatives. For example, in the case of interest rate derivatives, we observe that corruption is significant determinant influencing firm's extent of using derivatives, while we do not find any significant effect of government effectiveness and country risk on firms' level of derivatives use.

The findings from pooled Tobit models regarding corruption level conforms to the results from pooled probit that factors affecting derivatives use by firms in highly corrupt countries somewhat differ from firms in low corrupt countries. Further, to control for endogeneity issue, we conducted lagged variables in panel data framework based on corruption levels. We notice that firms in countries with low corruption level use derivatives to hedge exposures, while firms located in highly corrupt countries use derivatives for selective hedging and not for reasons stated by hedging theory. For example, we are unable to find any significant relation between derivative intensity and the possibility of firms in highly corrupt countries to use derivatives to reduce costs of bankruptcy and financial distress, agency costs of debt, economies of scales, and corporate tax burden. But we observe that firms located in low corruption countries use derivatives to reduce expected tax liability.

7.2.2. Derivatives use and firm value

In chapter 5, improving upon the prior studies, we have scrutinized the value effects of derivatives use on domestic firms, domestic MNCs, and foreign affiliates from different aspects of corruption environments in home and host countries. Following most of previous studies, we use Tobin's Q as a measure of firm value. The univariate tests yield mixed results. For domestic firms, the mean of Tobin's Q for users is 0.509, compared to the mean of Tobin's Q for non-users of 0.418, leading to a hedging premium of 0.091. Likewise, we also obtain a positive

hedging premium of 0.355 for domestic MNCs, indicating that derivatives users have a higher firm value than non-users. However, in terms of foreign affiliates, non-users are characterized by higher Tobin's Q than users, leading to a hedging discount of 0.013.

The results from the OLS regression indicate that the use of financial derivatives is a value-enhancing activity for domestic firms and domestic MNCs, a low corruption environment facilitates the use of derivatives and rewards those firms with higher firm value. In particular, in low corrupt countries, derivatives use increases value of domestic firms from 9.87% to 11.77%. Meanwhile, hedging premiums of domestic MNCs in low corrupt countries are from 10.78% to 12.72%, which supports our hypothesis that domestic MNCs are more valuable than domestic firms in light of corruption, though it is not striking. In contrast with domestic firms and domestic MNCs, the findings from OLS estimation show that the use of derivatives decreases value of foreign affiliates with hedging discount of 7%. However, we still observe that foreign affiliates engaging in derivatives use, which reside in a country with a low corruption environment, are more valuable than those affiliates residing in a country with a high corruption level.

We then have investigated how value implications of derivatives use under corruption differ across domestic firms, domestic MNCs, and foreign affiliates due to exogenous shocks brought about by the 2007-2008 global financial crisis. The finding shows that during the crisis period, benefits of derivatives use on firm value does not gain for all firm types, and the effect of low level of corruption on alleviating negative impacts of the crisis on derivatives use is very moderate. Yet, low corruption level of home country is positively associated with hedging premiums of domestic firms and domestic MNCs in the post-crisis period, and low corruption level rewards domestic MNCs with higher firm value. In terms of foreign affiliates, they are

more valuable in host countries where corruption is less severe, even though there exists a negative association between derivatives use and firm value.

We have checked the robustness of our inferences by implementing instrumental variable (IV) model to control for potential endogeneity issue, Heckman test to control for self-selection bias, and using firm market value as an alternative for Tobin's Q in OLS model. Overall, the results of these tests are consistent with our main previous findings from OLS estimations. Specifically, the findings from IV model indicate that countries with low corruption induce domestic firms and domestic MNCs to use financial derivatives for hedging and rewards those firms with higher value, and the intensifying derivatives use enables domestic MNCs to increase firm value more efficiently than domestic firms. Meanwhile, we observe derivatives use decreases firm values of foreign affiliates by 5.28%, which is lower than hedging discount of 7% found in OLS estimation.

Likewise, Heckman treatment model confirms our previous findings that derivatives use is associated with an increase in firm value of domestic firms and domestic MNCs with hedging premiums of 4.2%, and 11.1%, respectively. Regarding foreign affiliates, we find that derivatives use decreases firm value by 6.89%, although they are more valuable in low corrupt countries.

7.2.3. Derivatives use and exposures

In chapter 6, we have assessed the effect of financial derivatives use on different exposures to country risks, exchange rate, and interest rate risks on the comparison of domestic firms, domestic MNCs, and foreign affiliates. We estimated exposures by applying the market model, which is developed by Alder and Dumas (1984), and augmented by Jorion (1990). Specifically, to our knowledge so far, we are one of the first to measure the exposure to country risks. The results from Univariate test show that domestic firms have the highest overall exposures, while

domestic MNCs have smaller exposures than domestic firms and foreign affiliates. In addition, the general results suggest that derivatives use is effective in reducing exposures.

We first have investigated the dynamic relation between derivatives use and exposures by implementing pooled regression models. We find that financial hedging through derivatives use reduces exposures to home country risks for domestic firms and domestic MNCs by 11.4% and 13.4% for each 1% increase in notional holdings, respectively. Yet, we are unable to find any evidence supporting a relationship between derivatives use of foreign affiliates and exposures to host country risks, even though derivatives use has a negative effect on exposure.

Similar results are found in terms of exchange rate exposure, that is, the use of foreign currency derivatives is significantly and inversely associated with exchange rate exposure in the case of domestic firms and domestic MNCs, but it is not different from zero at any standard level in the case of foreign affiliates. With respect to interest rate exposure, the results are somewhat different, insofar as negative and significant signs on the use of interest rate derivatives show that derivatives use has significant impact on mitigating interest rate exposure, regardless of domestic firms, domestic MNCs, or foreign affiliates.

When we conduct an analysis of association between derivatives use and exposures before-, during-, and after the global financial crisis, we observe that the financial crisis weakens the benefits of derivatives use. For example, we are unable to find evidence that derivatives use significantly reduces domestic firms and foreign affiliates' exposure to country risks, while the effect of domestic MNCs' derivatives activities on exposure to home country risks is modest, that is 2.97% lower exposure per 1% increase in notional holdings. In contrast, the effect of financial hedging on exposures in the post-crisis period, in general, is stronger than those in the pre-crisis period. For instance, the statistically significant estimated coefficients of derivatives

use show a decrease in exposure of 10.4%, 14.6%, and 10.74% for each 1% increase in notional derivative holdings for domestic firms, domestic MNCs, and foreign affiliates, respectively.

We observe that our main findings obtained from pooled regression models still hold after accounting for potential endogeneity by employing IV approach. We find a significant negative relation between the use of derivatives and exposures to home country risks, and exchange rate risks for domestic firms, and domestic MNCs; while the estimated coefficients on derivatives use of foreign affiliates are found to be insignificant at any standard level. We also note that there is a significant inverse relationship between the use of interest rate derivatives and exposure to interest rate risks regardless of whether firms are domestic firms, domestic MNCs, or foreign affiliates. On the other hand, findings from additional robustness test, that is panel data regression with random effect specification, are very similar to those found from pooled regression models, indicating that our main inferences are mostly robust.

7.3. Limitations and suggestions for future research

There are many potential ways to extend our study in terms of data, empirical methodology, and research topic. The following discussion provides some specific suggestions on useful areas for future research.

In this study, we estimate derivative intensity by using notional values of derivatives contracts held by each firm, because up to now, regarding derivatives holdings disclosures, the sample firms are not required to report detailed information on specific positions of notional holdings. Although total notional values effectively measure derivative ownership, it may not serve well as an estimate of derivative activities if a firm holds offsetting contracts (Judge, 2006). Thus, a more appropriate measure in future research would be the absolute value of net derivatives positions in each type of derivatives.

We focus on analyzing the role of country-specific factors on shaping decisions on using derivatives of non-financial firms in 8 East Asian countries. While that number of sample countries effectively identifies country effects on derivatives activities, a bigger number of countries under consideration could provide a better view and evidence on implications of country-specific factors. Thus, a potential direction for future research could cover a broader range of countries with more heterogeneous economic, political, and social environments; heterogeneity will allow researchers to further explore effects of institutional environments on behaviors of various firms, including derivatives use.

Further, after exploring the relationship between derivatives use and country-level governance quality, we stress the importance of incorporating country-level characteristics to investigate motivations for using derivatives of non-financial firms. Therefore, it would be worthy providing more robust country effects by examining other institutional factors such as legal system, financial policy uncertainty or elections. Another area for future research would be to develop a model framework, which links governance quality and possibility of using financial derivatives by non-financial firms.

Additionally, it is rather complicated to explore the role of derivatives in the context of financial crisis because excessive use of derivatives might actually leads to crisis, and the financial crisis occurred globally. As such, most parties were affected (exposed) by the crisis at around the same time. Given this, it is tricky to see how derivatives could help gain hedging benefits. That limitation opens up an avenue for future research to investigate possibility and/or levels that the use of derivatives would lead to a recession or crisis.

Moreover, based on findings obtained from empirical analysis of relationship between derivatives use and firm value, we recognize that firms' hedging activities significantly affect

firm value. Thus, behavioral reasons arising from firms' managers such as CEO, CFO could be a fruitful focus for future research. It is because the interaction between derivatives use and managers' risk attitudes and/or interests is relatively unexplored, whereas obviously firm managers determine hedging policies. Selective hedging can be a promising direction that deserves further attention as selective hedging can arise from the equilibrium in an optimal hedging model when firms' optional hedging activities entail the total current value of future earnings (Wojakowski, 2012).

Finally, we measure exposures, especially exposures to country risks by applying the market model augmented by Jorion (1990). Although the market model is the most common approach to estimate exposures to market risks in the existing literature, that measurement is relatively subjective, so more research in the future may be needed to improve a model to measure more proper exposures to country risks. For example, we could build a model, in which it controls for the relationship between the returns of firms and a few country-level institutional factors.

7.4. Contributions

7.4.1. Theoretical and methodological contributions

This research primarily contributes to the theoretical literature in the following ways:

The first theoretical contribution of this study is to incorporate institutional theory (e.g., North, 1990, 1994; Dunning, 2003; Peng, Lee, and Wang, 2005) and Dunning's OLI paradigm (Dunning, 1988; Dunning and Lundan, 2008) into the analysis of derivative activities. This approach sheds a new light to the hedging theory (e.g., Smith and Stulz, 1985; Mayers and Smith, 1990; Nance, Smith, and Smithson, 1993; Froot, Scharfstein, and Stein, 1993), which concentrates mainly on firm-specific characteristics. Through this research approach, we first demonstrate that a firm' decision on using financial derivatives is not only determined by factors

within that firm's boundary, and it is necessary to improve hedging theory as well as variables to measure determinants of derivatives use. Further, by joining institutional theory through investigating country-level governance quality with hedging theory through controlling firm-specific factors into one single framework of analysis, our study stresses the importance of incorporating country-level factors to explore motivations for using financial derivatives by non-financial firms. Such understanding also can offer a new explanation for the sources of advantages enabling firms in a country to exploit benefits of hedging better than those firms in another country.

Second, our research contributes to theoretical literature by taking an institution-based view of value effects of derivatives use for different firm types including domestic firms, domestic MNCs and foreign affiliates. It is important to highlight that our study adopts a new approach by applying concepts of institutional theory in international business (IB) to the recently developed conditional analysis of relationship between derivatives use and firm value in finance (e.g., Fauver and Naranjo, 2010, Allayannis, Lel, and Miller, 2012). In particular, improving upon recent conditional analysis, which investigates effects of internal firm issues only such as corporate governance or agency costs, we integrate country-level factors into research design and explain why and how financial derivatives use affects value of different domestic owned, and foreign owned firms under influence of home and host countries' corruption environments.

Doing so, our research methodology complements and adds a new line to the conditional analysis to demonstrate that testing a direct relation between derivatives use and firm value might lead to a bias, because there might be additional costs or monitoring problems related to the use of derivatives, which increases possibility of reducing firm value at the expense of shareholders. More importantly, our approach underlines the role as "rule of games" of

institutions in general (North, 1990, 1994), and corruption environment in particular[32], in shaping firm valuation, and argues that without directly taking into account institutional environment in analysis, it will be difficult to determine whether derivatives use is an value-enhancing activity. Our empirical findings suggest that this approach is necessary and highly promising, and opens up avenue for future research to exploit more in detail how institutions and the level of institutional development rewards or adds costs to firms' financial operations.

Third, to examine whether the use of financial derivatives can reduce multifaceted exposures for different firm types, we apply the market model (Alder and Dumas, 1984; Jorion, 1990) to estimate exposures to home and host country risks, which is one of the foremost theoretical contributions of this thesis. Starting from the concept of the market model that exchange rate exposure can be measured as a regression coefficient, we develop the idea to measure exposure to country risks based on the argument that exchange rate risk is not intrinsically different from other systematic risks such as interest rate risks. Our idea also derives from the fundamental logic that the interaction of institutions and markets determines country risks that drive firms' activities (Shapiro, 1999; Cantwell, Dunning, and Lundan, 2010; Allien and Carletti, 2013; Pástor and Veronesi, 2012, 2013) and firms are not free from country risks.

[32] While corruption is considered to be a more costly tax on business operation than legal taxes (Kaufmann and Wei, 1999), it has become a global phenomenon and firms usually engage in corrupt practices (Beets, 2005). In 2015, the United Nations Secretary General Ban Ki-moon sent a message that corruption is a threat to the development, democracy and stability, it distorts markets, curbs economic growth and discourages foreign investment, and it can lead to dissatisfaction with public institutions. Thus, it is likely that high corruption levels increase levels of exposures to market risks that firms face, increase hedging and transaction costs, thereby reducing firm value. Under such circumstances, an analysis of derivatives usage under influence of corruption is important to find out whether derivatives use increases firm value, and why using derivatives differs across countries.

The innovation and distinction of our method is to demonstrate clearly how country risk exposures can be measured as a regression coefficient by using well-know linear regression techniques. To our knowledge so far, we are one of the first to measure exposures to country risks, and contribute to the existing literature on this area by providing a quantitative measurement, which will open an access for researchers to exploit further perspectives of country risk exposures. This approach also conforms to interests of policy-makers, stockholders, investors, and analysts firms as efforts must be made by each firm to approximate and quantify their exposures.

Fourth, by investigating value implications of derivatives use in light of corruption environments of both home and host countries, and examining the relationship between derivatives use and exposures to both home and host country risks, our study complements and sheds a new light to the literature on firms' hedging behaviors, and emerging institution-based explanations of firm's performance that largely concentrate on the role of home-country institutions (Wu *et al.*, 2016). Our findings demonstrate that differences in institutional settings and systematic risks between a host market and a home market become conductive to implement hedging policy, and explain differences in effectiveness of exploiting hedging benefits for different firm types in different countries.

Finally, the fundamental starting point in discussion of conditions under which firms hedge and hedging can add value is Modigliani and Miller (MM) theorem. Modiglian and Miller (1958) find that under a specific set of assumptions about frictionless markets, equal access to market prices, rational investors, and equal access to costless information, hedging is irrelevant and cannot contribute to the creation of firm value. This thesis, therefore, improves upon key assumptions of MM theorem and contributes to methodological literature by building on

institutional conditions and heterogeneity of firm types, i.e. domestic firms, domestic MNCs, and foreign affiliates. We find that hedging can add value and rewards firms with higher value if there are well-governed and good-functioning institutions, and such effect of hedging somewhat depends on heterogeneity of firm types.

Overall, in this thesis we jointly integrates two strands of literatures i.e., IB and finance into one framework of analysis. Doing so, it makes contributions to each strand of literature. Regarding finance literature, we show that inconclusive evidence of the existing literature on derivatives use in particular, and on finance in general could be attributed to the lack of exploring the role of firm type heterogeneity, and institutional environments. We also contribute to IB literature by exploring an important instrument of risk management i.e., derivatives use, and its effectiveness by firm types. This thesis suggests that this aspect is new in IB literature.

7.4.2. Empirical contributions

Our study not only enriches the empirical literature by adding, to our best knowledge, the first East Asian evidence on determinants of derivatives use, value effects of derivatives use, and the association between the use of derivatives and exposures across 8 East Asian countries covering from developed countries to emerging economies, and with differences in terms of business, economic and political environments, but also contributes to the extant literature up to date in the following ways:

First, our research provides a comprehensive examination on determinants of derivatives use with a focus on country-specific factors that have not been thoroughly examined in the existing literature, namely governance mechanism, corruption levels and country risks. Our study strongly finds that countries' governance mechanisms have significant and positive effect on firms' decisions on derivatives use, and corruption levels play a significant role in explaining the

use of derivatives. These findings suggest that country-specific characteristics may explain some of ambiguity in the existing empirical literature. Combined with the finding that firms in well-governed countries use derivatives to hedge exposure and overcome their costs arising from market imperfections, whereas firms located in weakly governed countries use derivatives for speculation and/or selective hedging, our study further suggests that well-developed institutions compensate for hedging and other transaction costs, and in fact facilitate firm's derivatives activities.

Second, to our knowledge so far, this thesis is one of the first to examine how derivatives use affects firm value under influence of corruption environments. Our study evidences that low corruption level of home country rewards domestic firms and domestic MNCs with higher value (hedging premiums are from 9.87% to 11.77%, and 10.78% to 12.72% respectively), and foreign affiliates are more valuable in host countries where corruption is less severe. These findings support the view that high corruption levels increase additional costs to firms, thereby reducing expected cash flows, and ultimately value effect of firms using derivatives. The results also indicate that corruption environments are at different degrees in different countries, and countries differ remarkably in the extent to which corruption affects firms' derivatives activities.

Third, to the best of our knowledge, we are among the first to measure exposures to country risks by using the market model, and focus specifically on answering whether the use of financial derivatives can reduce those exposures. We provide a novel finding that derivatives activities of domestic firms and domestic MNCs significantly reduce exposures to home country risks by 11.4% and 13.4% per 1% increase in notional derivatives holdings, respectively, meanwhile foreign affiliates with derivatives use fail to mitigate exposures to their host country risks. Our study therefore contributes to the literature on exposures by demonstrating the importance of

financial derivatives use for domestic firms, and domestic MNCs in understanding and hedging exposure to home country risks. These results also support the view that business operations of foreign affiliates are more complicated than those of domestic owned firms (Kim and Pantzalis, 2003), and performance of foreign affiliates in some emerging countries, such as China, Indonesia and Thailand, is "high risk, low return" (Chan, Isobe, and Makino, 2008)

Fourth, our study is different from the prior studies in the way of comparing value effects of derivatives use for a wide range of firm types including domestic firms, domestic MNCs, and foreign affiliates in order to answer important but unexplored questions: what firm type in which value implication of derivatives use is greater; and what corruption level rewards firm with higher value. Our findings consistently notice that domestic MNCs outperform domestic firms and foreign affiliates, and evidence that home country's low corruption levels favor domestic MNCs than domestics firms. On the one hand, the results demonstrate that domestic MNCs with derivatives policies outperform other firms due to their superior ability to engage in financial and operational hedging, which should be able to offset some exposures they face. On the other hand, they indicate that firms do not equally enable to exploit favorable institutional conditions and environments.

Fifth, we complement and shed new light on the current literature on hedging when we evidence the outperformance of domestic MNCs in reducing exposures to exchange rate, and interest rate risks relative to domestic firms and foreign affiliates. Domestic MNCs experience 18.2% and 19.0% decline in exposures to exchange rate, and interest rate risks for each 1% increase in notional holdings, respectively, which is higher than the rates of 10.4% and 11.8% decrease in those respective exposures in the case of domestic firms. Notably, derivatives use of foreign affiliates is only effective in alleviating exposure to interest rate risk by 3.07%.

Finally, our study uses a new hand-collected data set of derivatives use and provides greater statistical power. Data spans the global financial crisis of 2007-2008, which provides us the unique natural experiment of derivatives use and financial risks, and allows us to provide new insights into firms' hedging activities during that turbulent period. Our study observes that during the crisis, benefits of derivatives use do not gain. However, there are strong links between derivatives use and firm value, and exposures for domestic firms and domestic MNCs in the post-crisis. These findings support the view that the financial crisis causes a sudden and big exogenous shock, firms are unable to adjust to new system (Chakrabarti *et al.,* 2007, Enikolopov *et al.,* 2014), so the use of derivatives cannot reduce exposures to market risks while hedging costs are higher due to fluctuation in exchange rates and escalation in financial costs and prices.

7.4.3. Managerial implications

While firms in East Asian countries have been playing an important role as active participants in derivatives markets and account for one third of global trading volume[33], the reasons why East Asian non-financial firms hedge are not well explored. Likewise, the fundamental questions whether the use of derivatives increases firm value and/or reduces exposures that firms face are still unknown. On the other hand, even though there is vast evidence on derivatives use by firms in U.S and European developed firms, these countries have quite similar economic, financial and social environments. Our sample of East Asia countries, in contrast covers both developed and developing countries with heterogeneity in institutional environments, which enables us to exploit comprehensively multifaceted hedging behaviors of a wide range of firm types. As such, this thesis provides important practical implications to firm managers, country-level regulators, and policy makers as below:

[33] FIA. 2015. *FIA annual volume survey.* Future Industry Association

First, our research approach and findings propose some avenues for further theoretical and empirical research on institutional environments and firms' hedging activities aimed at elucidating firms' decision on using derivatives. Additionally, the study provides important policy implications emphasizing the role of policy makers in institutional development to facilitate firms to explore benefits of hedging such as enhancing legal systems, and improving government efficiency.

Second, the empirical findings provide useful and practical insights to firms' managers to increase their firm value through derivative activities, and clearly suggest that they should include measures for home/host country's corruption levels when determining hedging policy. Additionally, our findings provide direct implications for firms' managers on decision regarding capital structure. It suggests that firms could influence cost of capital in particular, and capital structure in general by using financial derivatives, thus firm managers better perform the important tasks of strategic capital planning and managing risks.

Third, our findings also have practical and meaningful implications for policy-makers and regulators. The study first proposes that regulators or policy-makers should be more active in cracking down corruption levels in order to enhance performances of non-financial firms using derivatives. Further, the finding that a firm's exposure to home country risk is mitigated through the use of financial derivatives suggests that effective management of derivative markets is necessary to ensure stability of financial system and economy in general.

Fourth, due to characteristics of our wide range sample firms including both domestic-owned, and foreign-owned firms, and our sample countries covering both developed and developing countries, the results of this thesis can be easily generalized into any other developing and developed countries in which there are non-financial firms using financial

derivatives, as well as country-level governance and corruption exist. Further, our sample consists of Japan- the world's third largest economy, and China- the second largest economy and a key player in the world economy and markets, thus the results of this thesis can be applicable to various aspects of international business and finance.

Table 7.1: Summary of hypotheses

Hypotheses	Empirical findings support/oppose
Hypothesis 1: Firms located in countries with higher corruption levels are less likely to use derivatives	Support
Hypothesis 1a: High levels of corruption discourage firms from using derivatives to reduce exposure as stated by hedging theory	Support
Hypothesis 2: Firms located in countries with higher governance quality are more prone to use derivatives	Support
Hypothesis 3: Firms in countries with higher country risk have more incentive to use derivatives	Support
Hypothesis 4: The lower is the corruption level; the higher is the likelihood that the use of financial derivatives increases firm value	Support
Hypothesis 5a: In light of corruption environment, the use of financial derivatives is more valuable in domestic MNCs than in domestic firms	Support
Hypothesis 5b: Under influence of corruption environment, the use of financial derivatives rewards domestic MNCs with higher value than foreign affiliates	Support
Hypothesis 6a: The global financial crisis worsens the value effect of derivatives usage under corruption environment, and there is positive relationship between derivatives use and firm value in post-crisis period	Support
Hypothesis 6b: Low level of corruption mitigates negative impacts caused by the global financial crisis on the value effect of derivatives use	Support
Hypothesis 7a: The use of foreign currency derivatives reduces exchange rate exposure	Support
Hypothesis 7b: The use of interest rate derivatives reduces exposure to interest rate risk	Support
Hypothesis 8: There is negative relationship between the use of financial derivatives and exposure to country risk	Support
Hypothesis 9: The use of derivatives by domestic MNCs decreases a larger magnitude of exposure than domestic firms and foreign affiliates	Support
Hypothesis 10a: The global financial crisis weakens the relationship between derivatives usage and exposures	Support
Hypothesis 10b: Derivatives use is negatively related to exposures in the post-crisis period	Support

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